

ROYAL COMMISSION
ON
AGRICULTURE IN INDIA

ABRIDGED REPORT



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NOTE

This abridged version of the Report of the Royal Commission on Agriculture in India has been prepared with a view to placing the main conclusions stated in that Report before a wider public than is likely to be reached by the full Report. Should it appear that there is any conflict of sense between the abridged version and the relevant passage of the full Report, the full Report should invariably be regarded as the authoritative document.

J. A. MADAN,

F. W. H. SMITH,

Joint Secretaries.

The 14th April 1928.

Abridged Report

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ABRIDGED REPORT

I. INTRODUCTION AND HISTORICAL RETROSPECT

The Royal Commission on Agriculture in India is the first appointed specifically to examine and report on the conditions of agriculture and rural economy in India. The Famine Commissions of 1880, 1898 and 1901, the Irrigation Commission of 1903 and the Committee on Co-operation of 1915 made many recommendations for the improvement of agriculture and for the promotion of the welfare and prosperity of the rural population. The Reports of the Famine Commissions were landmarks in the history of the agricultural development of India. The Famine Commissions were naturally, in the main, concerned with the steps necessary on the part of Government to diminish the severity of famine or to place the people in a better position to meet it. The Commission of 1880 arrived at the general conclusion that "it is to the improvement of the internal communications and the removal of all obstructions to the free course of trade, accompanied by the extension of irrigation in suitable localities and an improved agriculture that we must look for obtaining security in future against disastrous failures in the food supply." The proposals of this Commission powerfully influenced for good agrarian and administrative reform in India for the next twenty years.

To the Commission of 1901, we owe the development of agricultural departments working on scientific lines for the improvement of agriculture and also the initiation of the co-operative credit movement. This Commission found that "the steady application to agricultural problems of research is the crying necessity of the time" but reinforced this with the warning that "security of the harvest only postpones the pressure of the population on the soil; it is prudence and knowledge and the practice of thrift alone which will relieve it." The necessity for an improvement in agricultural method and for agricultural research had been emphasised by preceding Commissions, but, in the early days, the time of agricultural departments was largely taken up with statistical work and with the elaboration of machinery to deal with famine conditions. Agricultural research was spasmodic and lacked continuity and there was little attempt at building up a scientific department, mainly because workers were few.

By the beginning of this century, however, there was a great awakening of interest in the scientific study of agriculture in Great Britain and in India; and, as the result of the recommendations of the Famine Commission of 1901 and the Irrigation Commission of 1903, a forward policy in matters of agricultural research and improvement was embarked on by the Government of Lord Curzon, to whose far-sighted vision much of the progress of Indian agriculture must be attributed.

On the 4th of June, 1903, the Government of India addressed to the Secretary of State a despatch with which was submitted a scheme for the establishment of an agricultural research institute, an experimental farm and an agricultural college at Pusa in the Darbhanga district of Bihar. This despatch marks the beginning of organised agricultural research in India. To the establishment of the research station, Lord Curzon devoted the greater portion of a generous donation of £30,000 which had been given him by an American gentleman, Mr. Henry Phipps of Chicago, to be applied to some object of utility preferably connected with scientific research. In pursuance of the scheme outlined in the despatch, a research station with fully equipped laboratories, an experimental farm, an agricultural college for the training of students and a cattle farm for the improvement of the local breeds of cattle were established on the Pusa estate.

Lord Curzon's Government fully realised that a central institution under the direct control of the Government of India could only be the apex of their scheme and that such an institution would be valueless unless there were, at the same time, a real development of agriculture in the provinces. In 1905, therefore, the Government of India announced their intention of setting aside annually a sum of Rs. 20 lakhs which was subsequently increased to Rs. 24 lakhs for the development of agricultural research, experiment, demonstration and education in the provinces. The aim which the Government set before themselves was the establishment of agricultural colleges with a course of three years' duration in all the provinces and the provision of an expert staff for these institutions for purposes of research as well as for instruction. The link between the colleges and the districts was to be provided by experimental farms in charge of officers whose duty it would be to keep in close touch with the cultivators and advise them in regard to the introduction of improved methods of agriculture. In pursuance of this scheme, colleges were started or reorganised at Poona, Cawnpore, Nagpur, Lyallpur, Coimbatore and Sabour. The college at Sabour was closed at the end of 1921. A college was opened at Mandalay in 1924. A separate Department of Agriculture was constituted in most provinces and a scientific staff entertained.

For district work, a province is divided into a number of circles, each under a deputy director of agriculture. This officer is primarily responsible for the management of the experimental, seed and demonstration farms and plots in his circle as well as for seed and implement distribution and general agricultural propaganda. He is provided with agricultural assistants, drawn from the Provincial Agricultural Service and other staff.

That great progress had been achieved by the agricultural departments cannot be denied but their influence has, so far, reached a very small fraction of the total area. But, though, throughout our Report we deal at length with the problem of improving the efficiency of these departments and of extending their activities over the whole area of agricultural India, we regard this as merely one aspect of the far wider problem of creating an environment in which the

cultivator will be willing to receive and put to the best possible use the advice and help which the agricultural and other departments are in a position to place at his disposal. Our enquiry, therefore, extends to the activities of all departments which are closely concerned with rural welfare. We endeavour to show the contribution which each of them—Agricultural, Veterinary, Forest, Irrigation, Co-operative, Public Health, Education and Industries can make to the creation of an environment favourable to progress in all directions. Our object is, in short, to suggest ways and means of assisting the advance of the rural community towards a fuller life. These must be designed at once to awaken the desire in that community for better things and to arm each individual member of it against the temptations that beset him without impairing either his self-respect or his spirit of manly independence.

II. THE ORGANISATION OF AGRICULTURAL RESEARCH

As a result of the constitutional changes of 1919, the Government of India divested themselves, except to a very limited extent, of all powers of superintendence, direction and control over the administration of "transferred" subjects of which, from the point of view of our enquiries, agricultural and veterinary subjects are the most important. The administration of central agencies and institutions for research and for professional and technical training was retained as a "central" subject, but no specific provision was made for co-ordinating the work of these with that of similar institutions in the provinces. Thus, the provincial departments have, in the all-important matter of research, been left without the stimulus of a central organisation which could guide and co-ordinate their policy. Although no specific provision has been made in the Constitution of 1919 for co-ordinating research work, either as between the central and provincial spheres or as between province and province, there is nothing inherent in that Constitution which prevents appropriate machinery being devised for that purpose.

The basis of all agricultural progress is experiment. However efficient the organisation which is built up for demonstration and propaganda, unless that organisation is based on the solid foundations provided by research, it is merely a house built on sand. In spite of the marked progress which has been made in many directions during the last quarter of a century, it is hardly an exaggeration to say that agricultural research in this country is still in its infancy. The claims of research have received a half-hearted recognition and the importance of its efficient organisation and conduct is still little understood. The history of the scientific organisation of agriculture in other countries of wide extent and strong local administrations such as the United States of America, Canada and Australia should not make this comparative lack of appreciation of the need for organisation a matter of surprise. We have carefully studied the organisations which they have adopted and have had an opportunity of examining their representatives. We believe that the time will come in India as it has already come in those countries, when the indispensable part, which a central organisation has to play in the fields of agricultural research, and of rural development generally, will be fully recognised.

We think, indeed, that, with the undoubted demand for an increase in the pace of agricultural progress, the time has even now come when there will be a general measure of support throughout the country for proposals designed to promote co-ordination of a more effective character than would be provided by the continued existence of the appointment of Agricultural Adviser to the Government of India and by conferences of Ministers and Directors of Agriculture and meetings of the Board of Agriculture.

A reference has already been made to the Agricultural Research Institute at Pusa which is maintained by the Government of India. We feel strongly that it is essential to the advancement of agricultural research in India that Pusa should be brought into closer touch with the provincial

departments of agriculture and the latter with each other. We have considered various alternative schemes for effecting this. We have examined the possibility of what may be called sectionalising research, in other words, the possibility of constituting crop committees on the lines of the Indian Central Cotton Committee. Apart from other difficulties, a research organisation based only on crops would not fit in with the organisation of the work of Pusa and the provincial research institutions which is based on an entirely different and more logical division of research into branches of agricultural science. We have also considered the possibility of transferring the control of Pusa from the Government of India to a quasi-independent governing body on which the provinces would be represented but we doubt if this would provide in practice the requisite degree of co-ordination between the research work at Pusa and that in the provinces. We have finally come to the conclusion that a new organisation is needed to connect Pusa and the provincial research institutes—an organisation to which both will stand in exactly the same relation.

We propose that an Imperial Council of Agricultural Research should be constituted, the primary function of which would be to promote, guide and co-ordinate agricultural research throughout India. It would not exercise any administrative control over the Imperial or provincial research institutions. It would be a body to which the Imperial and provincial departments of agriculture could look for guidance in all matters connected with research and to which such research programmes as they might choose would be submitted for criticism and approval. Our object in proposing that such a body should be constituted is to provide provincial governments with an organisation embracing the whole research activities of the country, veterinary as well as agricultural, in which they can feel that they have a real and lively interest. That interest will undoubtedly be greatly accentuated if the Council is entrusted with the administration of funds with which it can supplement provincial activities in the matter of agricultural research. We, therefore, propose that the Council should be entrusted with the administration of a non-lapsing fund of Rs. 50 lakhs to which additions should be made from time to time as financial conditions permit. This is, in our view, the minimum grant which can usefully be made and we have only been able to propose so low a figure on the assumption that provision for the cost of existing institutions and for normal expansion will be met from central or provincial revenues as the case may be. The Council of Agricultural Research and the Agricultural Research Fund should be constituted by an Act of the Imperial Legislature. The position of the Council of Agricultural Research in relation to the administration of the research fund would be analogous to that of the Indian Central Cotton Committee in relation to the funds raised under the provisions of the Indian Cotton Cess Act of 1923. Subject to such conditions as might be prescribed, the capital and income of the fund and any other funds received by the Council would be utilised in meeting its expenses and the cost of such measures as it might decide to undertake for promoting agricultural and technological research in the interests of agriculture in India. The powers of the Council would be regulated by rules issued by

the Governor General in Council in the Department of Education, Health and Lands similar to those issued under section 15 of the Indian Cotton Cess Act. These rules would *inter aliu* regulate the powers of the Council to enter into contracts and to appoint and pay officers and servants. They would further regulate the powers of the Council to incur expenditure and provide for the submission of its budget to the Governor General in Council for sanction and for the audit and publication of its accounts. We would here express the earnest hope that the agricultural research fund thus constituted will, in course of time, be considerably augmented by private benefactions. It cannot be regarded as a matter for satisfaction that the only names hitherto associated in this way with the advancement of agricultural research in India should be those of Mr. Henry Phipps of America and of the late Sir Sassoon David of Bombay.

One of the most important functions of the Council will be in regard to the training of research workers and part of its funds should be utilised in the provision of research scholarships tenable by students who have given evidence that they are capable of taking full advantage of an opportunity for intensive training in scientific research in agriculture. The Council will act as a clearing house for information and will establish bureaux for crops as well as for animal husbandry, dairying and veterinary matters. It will take over the publication work at present done by the Agricultural Adviser to the Government of India and will arrange for sectional meetings of experts in particular branches of agricultural science. We do not contemplate that the Council should have research stations directly under its control or should have its own staff of experts. It would be for the Council to decide whether a particular piece of research work is of all-India or merely of local importance and, if the former, whether it can best be carried out at an Imperial or provincial research institution or entirely outside such institutions, in a university, by private individuals, or even abroad. In order to bring the financial position of the Council into relation with the present Constitution, it will be necessary to include in the Devolution Rules a declaration that the development of agricultural research by a central authority is expedient in the public interest.

As a link with the Central Research Council, we would recommend that a Provincial Research Committee should be established in each of the major provinces which will work in close co-operation with the Council.

We propose that the Council should consist of 39 members. Three of these would be whole-time members—the Chairman, who should be an experienced administrator with a knowledge, if possible, of Indian conditions, and two eminent scientists qualified to represent respectively the interests of agriculture and animal husbandry. Of the remaining thirty-six members, eight would be nominated by the Government of India, eighteen would represent the provincial, agricultural and veterinary departments, three would represent the Indian universities, two would represent the Indian Central Cotton Committee and the planting community respectively and five would be non-official members

nominated by the Council, by reason of their scientific knowledge or the special qualifications, for the approval of the Government of India. The Chairman and the two whole-time members might be appointed for five years and the other members for three years as a general rule. Provision should be made for extending these periods.

We do not consider that it will be necessary for the Council to meet ordinarily more than twice yearly. In view of the great distances in India, more frequent meetings would involve an undesirable degree of interference with the ordinary duties of the great majority of its members. It would, however, be necessary to make provision for the conduct of business between meetings and we are of opinion that this can best be done by a provision in the legislation constituting the Council, permitting the Council, with the previous sanction of the Governor General in Council, to make rules, *inter alia*, for the election of a Standing Finance Committee from amongst its own members and the delegation to it of any powers exercisable by the Council. Subject to such restrictions as might at any time be imposed by the Council, this Committee would exercise all the powers of the Council in regard to the control and disposal of its funds and also such other powers as might be delegated to it by the Council. The Chairman of the Council would be *ex-officio* chairman of this Committee and the two whole-time members of the Council should be members of it. Beyond this, the only suggestion we would make is that, as the most important function of the Committee will be to deal with applications for grants for research institutions, no member of the Council directly connected with any research institution should be a member of it. The Council will undoubtedly find it advisable to do much of its work other than that connected with financial matters through sub-committees. These sub-committees should have power to co-opt members from outside the Council to assist them in dealing with special questions. The most suitable headquarters for the Council would be those of the Government of India—Delhi and Simla. The possibility of establishing a Development Commission for India on the lines of that established for Great Britain has naturally occurred to us. The idea is an attractive one, but the limitations imposed by the existing Constitution are such as, in our view, rule any proposal of this kind out of consideration in present conditions. If conditions alter, the Council of Agricultural Research which we propose could be expanded to include all activities that have any bearing on rural progress.

On the formation of the Council of Agricultural Research, the necessity for an Agricultural Adviser to the Government of India will disappear. This officer is at present the Director of the Pusa Institute. A whole-time Director will be required for Pusa who in addition to the administrative control of that Institute will also exercise administrative control over sub-stations now under the Agricultural Adviser but not over the Imperial Institute of Veterinary Research at Muktesar for which other arrangements are proposed in Section VII (Chapter IX. of the main Report). On the constitution of the new superior provincial

agricultural services, the functions of Pusa as a centre for higher agricultural education are likely to be extended and it will be for the Council of Agricultural Research to suggest such alterations as are necessary to render Pusa a teaching institution of the highest standard. An approved course of post-graduate study should be regarded as an essential qualification for admission to the new superior provincial agricultural services. We hope that the universities will take an increasing share in the prosecution of agricultural research and it is with the object of facilitating this that we have suggested that they should be represented on the Council of Agricultural Research. The first step seems to be an improvement of the standard of their scientific teaching. Grants might be given by the Council for research work in connection with agriculture carried out at the universities. The most suitable link between Pusa and the universities would be an arrangement under which research work carried out at Pusa could be submitted as a thesis for the degree of M.Sc. or D.Sc. of the university of which the student was a graduate.

Although we do not consider that research can conveniently be organised by Government on a crop basis, we see no objection to any trade, which feels that its interests demand such a step, organising itself on the lines of the Indian Central Cotton Committee, provided it is willing to tax itself for this purpose. The case of jute presents special features and we consider it most desirable that a committee should be formed which would watch over the interests of all branches of the trade from the field to the factory. The Chairman of the Council of Agricultural Research should be chairman of this Central Jute Committee and Government should finance the work of the Committee by an annual grant of Rs. 5 lakhs.

Pusa is not in all respects an ideal site for a research institution for all India. The Council of Agricultural Research will, therefore, have to determine how far its deficiencies in regard to the problems of tropical India can be remedied by the establishment of small sub-stations. They will also have to decide to what extent the funds which will be placed at its disposal for the advancement of agricultural research can suitably be utilised for the opening of such sub-stations.

It is our view that the Board of Agriculture which, *inter alia*, provides the only means by which, in present conditions, Indian States can be brought in touch with the agricultural problems of British India and the methods employed in solving them will still have many useful functions to perform after the Council of Research has been set up. We, therefore, are strongly of opinion that the Board should continue to meet under the chairmanship of the Chairman of the Council of Research and that the Council should advise the Government of India as to any changes in its constitution which may seem calculated to promote its usefulness.

III. AGRICULTURAL IMPROVEMENT AND THE SUB-DIVISION AND FRAGMENTATION OF HOLDINGS

The principal concern of this Commission is to suggest the lines on which agriculture in India can be improved. CHAPTER IV OF THE MAIN REPORT. The field is a vast one and the diversity of soils, local conditions and agricultural practices is very great. As an indication of the immensity of areas under the various crops, it may be noted that there are over 80 million acres under rice, some 24 million acres under wheat, 33 millions under the greater millets, *juar* and *bajra*, 18 millions under cotton, 14 millions under the principal oil-seeds and 14 millions under gram.

The soils of India may be broadly divided into four groups (a) the "red" soils of the crystalline tract, (b) the black cotton or *regur* soils, (c) the alluvial soils and (d) the laterite soils. These vary remarkably in agricultural properties and the desirability of soil surveys has been frequently pressed upon us. While admitting its importance, we do not think it is a practicable proposition to undertake at the present time a soil survey for the whole of India on the lines of that now in progress in the United States of America. In view of the prohibitive cost of a complete and scientific soil survey, we recommend that agricultural departments should undertake intensive surveys only when there is some specific problem to be solved or when laboratory examination of soils is called for to interpret more fully valuable information already on record.

The question has been much argued whether the soils of India are to-day undergoing a progressive decline in fertility. Such experimental data as are at our disposal suggest the view that, in an overwhelming proportion of lands in India, a balance has been established and no further deterioration is likely to take place under existing conditions of cultivation. The chemists of the agricultural departments have devoted much attention to the study of local soil types and local soil conditions. Such a study is indeed an essential preliminary to the initiation of research into local problems. The discovery of deficiencies in plant food materials which results from these examinations of soil attracts attention to manurial problems, and these investigations have formed the basis for manurial experiments. The conclusion to be drawn from the results which have been already obtained is that the foundation has been well prepared, but that much more research is necessary and that rapid and uninterrupted progress cannot be expected unless the staff of research workers is largely increased. The time has come when the assistance of specialist officers can be usefully called in, more especially in the direction of bacteriological, physical and biological research.

Our attention has been drawn to marked cases of soil deterioration as a result of erosion of the surface soil by flood water. In the United Provinces, this has been arrested to a large extent by the afforestation of the ravine tracts; in Bombay, by the terracing of land and the construction of earth and stone embankments. Other tracts in which

the evil exists are western Bengal, the submontane districts of northern India generally and Chota Nagpur. The applicability to these tracts of the methods which seem to have proved successful in the United Provinces and in Bombay should be investigated.

It must be admitted that although a great deal of careful work has been done, little progress has been made in introducing improved manurial treatment into general agricultural practice. The agricultural departments are not yet in a position to give definite advice in regard to the economic use of fertilisers. There is justification for the view that improved varieties of crops require for their fullest development more liberal manurial treatment than those ordinarily grown, but the subject is one which requires the most careful study by the agricultural departments. A large amount of information—the result of experiment—has been collected. This, we consider, should be carefully studied and the results obtained correlated. A definite programme of experiment should be laid down to ascertain, with all possible accuracy, the extent to which fertilisers can be used with profit. This is a matter of such great importance that we consider the Council of Research might suitably undertake the direction of investigations. This Council should be in a position to advise as to the manner in which experiments can best be conducted so as to secure uniformity of method and to render results obtained in one province of value to other provinces.

The most readily available supply of plant food is, of course, farmyard manure. But, unfortunately, a very large amount of this is lost to agriculture through the custom of using cowdung cakes for domestic fuel. No satisfactory alternative has been suggested where coal and wood are dear. If the practice of using the refuse of crops such as cotton stalks, megass, etc., as fuel could be extended, there would probably be less wastage of farmyard manure. Much more might, however, be done to conserve at any rate that portion of the manure which is not used for fuel purposes. This is a matter to which the agricultural departments should devote their attention. The manufacture of composts and of synthetic farmyard manure, and, where night soil is available, of poudrette by municipalities are directions in which investigation is called for. The activated sludge process provides a means of overcoming the objections of the cultivator to the use of night soil. Other matters which require close study, especially from the point of view of the small cultivator, are the place and value of leguminous crops in the cultivator's rotations and the economics of growing green manured crops.

Oil-seeds are an important crop in India and, if applied as manure in the form of cake, would give a very large supply of combined nitrogen. They are not much used for this purpose at present. The only method by which their advantages can be secured is by the development of the oil-crushing industry coupled with great changes in cattle management and the abandonment of the custom of using cattle manure as fuel. An extension of the oil-crushing industry would undoubtedly tend to promote the welfare of the Indian agriculturist.

and we would commend the investigation of its possibilities to all local governments.

Another source of nitrogen is found in sulphate of ammonia which is available as a by-product from coal, but the price factor limits its application to the most valuable crops such as sugarcane and garden crops and it is, therefore, unlikely to affect the small cultivator.

Other forms of manure which supply both nitrogen and phosphates are bones and bonemeal and fish manures. The crushing of bones is an industry which could be taken up on a larger scale in India but a far more thorough investigation of the economics of the bone-crushing industry than has yet been carried out is, we consider, required before the establishment of such mills by private enterprise can be encouraged. The first essential is to obtain definite data in regard to the price at which, and crops for which, the use of bonemeal is advantageous to the cultivator and we suggest that the agricultural departments should take early steps to collect this data. We do not consider that there is any justification for the restriction of the exports of oil-seeds and oilcakes, bones and bonemeal or fish manures by the imposition of an export duty or for the prohibition of such exports.

It may be said that the main success of the agricultural departments has been in the direction of the introduction of improved varieties of crops and in this branch of its work it has been eagerly assisted by the cultivator. It is estimated that nearly nine million acres are now under improved varieties of different crops. It is true that this only represents a small fraction of the total area under these crops, but, even so, it can be claimed that a substantial beginning has been made. The crops in which the greatest advance has been made are cotton, wheat, rice, groundnut and jute, but there is still very great scope for further work especially in regard to the millets, pulses and oil-seeds.

There are three methods of obtaining varieties superior to those ordinarily grown either in respect of yield, quality or suitability to the special conditions of environment. These are selection, hybridisation and acclimatisation. Of the three, selection seems to be the most hopeful line and that which offers the greatest immediate possibilities of effecting improvement in Indian conditions. Hybridising is highly specialised work and requires officers with a very special training and a wide knowledge of Indian conditions. Acclimatisation means the adaptation of exotic varieties to Indian conditions. The most notable achievement in this respect in recent years has been Cambodia cotton. This line of experiment, important though it is, should not take precedence of work on crops already grown in India. Whatever improved varieties may be evolved by selection or hybridisation, no new variety should be put out unless it has been thoroughly established that it possesses marked advantages over those already grown. It is important also that new varieties should be thoroughly tested on holdings typical of those in the tracts for which they are deemed suitable and also that the value of the new variety in its place in the

normal rotation of the cultivator should be proved. Such experiments should be carried on over a series of years.

We now pass to the question of distribution of the improved seed which has been evolved. The conditions of India in this respect are somewhat peculiar. Except for flower or vegetable seeds, there are no seed merchants in the sense in which the term is understood in European countries. For many years to come it seems probable that the work of seed distribution will have to remain in the hands of the agricultural departments. But if seed merchants of proved enterprise should be forthcoming, they should be given every encouragement. In present conditions, the co-operative agency seems to offer the best prospects of assistance to the agricultural departments in seed distribution though private seed agents, as distinct from seed merchants, might also be employed. They should be persons on whom the agricultural departments can rely and should deal only with seeds supplied by the departments in sealed bags or packets.

Until reliable seed merchants come into the business, the selection and distribution of pure seed should be controlled by the agricultural departments. It is not possible to lay down any rigid lines of policy. Departments must be guided by local conditions and must use such agencies as are available locally for the production and distribution of pure seed. But a considerable increase in the number of seed farms, both departmental and private, is very desirable. These can either be run departmentally or by cultivators who agree to grow seed for the departments under their supervision and control. Here again the co-operative movement can be of great assistance.

The problem of seed distribution is of such importance that, even with all the assistance which co-operative and other organisations can give, we consider that a separate organisation is necessary within the Agricultural Department, to deal with seed distribution and seed testing. The officer in charge of this work should be of the rank of a deputy director of agriculture and should take over all immediate administrative responsibility for seed testing and seed distribution. It would be his business to organise distribution through co-operative societies and other associations, through seed merchants wherever they are available, and through seed agents, as well as through the departmental staff and any other agencies which he may consider suitable. Whilst the agricultural departments ought not to look to seed distribution as a source of profit, the work has reached a stage at which it may legitimately be expected to pay its way.

Agricultural engineering is an important section of the activities of the agricultural departments and it is one to which, in our opinion, sufficient attention has not in the past been devoted. We consider that this section should be completely reorganised and that it should in all respects form an integral part of the department. Officers for the engineering branch should not only be recruited on the same terms as members of the new superior provincial agricultural services, but should be included in the cadre of those services. In provinces where

pumping and boring operations are of importance, it would probably be advantageous if this work could be entrusted to one branch of the engineering section and if a separate branch were to deal with agricultural machinery and implements. Where wells are numerous, it might be desirable to entrust the work on water-lifts to a third branch. All the activities of the agricultural engineering section should, however, be under the technical control of a senior engineer under the Director of Agriculture. This senior engineer could be selected either from the officers in the engineering section or from outside as necessitated by circumstances. Great care should be taken in the selection of the officer in charge of the work on implements and machinery. He should be a man who is not only an engineer but is also familiar with the use of agricultural machinery and implements. Amongst the most important problems to be dealt with by the engineering section is an enquiry into the capacity of the draught cattle of India with relation to the implements they are required to draw. Further, before discarding indigenous implements in favour of foreign designs, exhaustive trials are necessary to test the comparative merits of the two types under the conditions in which the cultivator works. In general, it may be laid down that the aim of the agricultural departments should be the evolution of a small number of types of implements and machinery suitable for a wide range of conditions and suitable also for mass production. In our view, the improvement of existing agricultural implements and machinery offers a more promising field than the introduction of new types.

It is desirable that, when new types have been evolved, their manufacture should be taken up by manufacturers in India. In order to overcome the difficulties of transporting such manufactures over the vast distances which one finds in India, we would suggest for the favourable consideration of the railway authorities a re-examination of railway freight rates on agricultural implements and machinery and the grant wherever possible of concessions. In this connection, it has also been represented to us that, whilst agricultural implements and machinery with a few exceptions are admitted into India free of duty, the high protective duties levied on imported iron and steel greatly increase the cost to the Indian manufacturer of his raw material whether imported or produced in India. We consider that this is a matter which might be investigated by the Indian Tariff Board.

Cultivators in dry and precarious tracts are those whose struggle for a livelihood is commonly the hardest. The problems of cultivation in such tracts in which crops are entirely dependent upon rainfall are, in our opinion, deserving of far closer attention than they have received from the agricultural departments.

The crops of the Indian cultivator like those of cultivators elsewhere are liable to suffer from insect pests and plant diseases. He is protected against the introduction of these from outside by the Destructive Insects and Pests Act (II of 1914). The rules framed under the Act are adequate but it is important that the co-operation of the maritime Indian States

should be secured, while Burma should consider the desirability of legislation to prevent the importation of pests and diseases from India. The Government of India as well as provincial governments should, as far as possible, strengthen their entomological and mycological staffs. It may also be advisable to frame provincial legislation to deal with internal pests and diseases, as has been done in Madras where an Agricultural Pests and Diseases Act was passed in 1919. Other dangers to crops are wild animals and vermin. The former can probably be dealt with by the grant of gun licenses on a more liberal scale, or by fencing if a cheap and effective method can be found. This is a matter for investigation by the agricultural departments. Where serious damage to crops is caused by vermin, a special staff might be organised for its destruction as in the Punjab and Sind.

A serious obstacle to agricultural improvement is, in some provinces, caused by the subdivision and fragmentation of holdings. Subdivision is chiefly due to the laws of inheritance customary amongst Hindus and Muhammadans which enjoins a succession to immovable property amongst all the heirs usually in equal shares. Fragmentation is, in the main, due not to the laws of inheritance but to the method by which the law as to division of property amongst the heirs is carried into effect. The problem is being attacked by the Co-operative Department in the Punjab where some striking results have been achieved, and by legislation in the Central Provinces. The latter method is also proposed in Bombay. In paragraph 126 of the main Report, we state the general principles which, we think, should be adopted in any legislation designed to promote the consolidation of holdings.

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IV. DEMONSTRATION AND PROPAGANDA

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In order that agricultural research may be of use to the cultivator, its results must be given to him in a form in which they may become a part of his ordinary practice. In a country in which illiteracy is so widespread as it is in India, ocular demonstration is the best method of convincing the cultivating classes of the advantages of agricultural improvement. But, before an improvement can be recommended for general adoption, it must be thoroughly tested on a government farm. It must be within the means of the cultivator to whom it is recommended and it must give a substantial financial advantage either in increased outturn or in the reduction of his cultivation expenses.

There are two methods of demonstration—the demonstration farm and the demonstration plot. Opinion is almost unanimous that the best and quickest method of influencing the practice of the cultivator is to demonstrate an improvement in crop or method on a small plot cultivated under departmental control or direction. This has the advantage of bringing the demonstration right into the heart of a village. The demonstration farm is open to the objection that it creates a suspicion in the mind of the cultivator that the methods by which it is cultivated are not applicable to his means and conditions. The farm buildings, which are often of a somewhat elaborate character, the superior cattle, the up-to-date implements and careful layout are apt to create an impression that the methods adopted are entirely beyond his means. Again, the influence of a demonstration farm is very limited and can only reach the cultivators in its immediate neighbourhood. If, however, a demonstration is carried out on the cultivator's own land, it is open to none of these objections. We admit, however, that demonstration farms may be necessary for special purposes, for example, to demonstrate the advantages of using a particular method of curing tobacco or of a small plant for making white sugar or high quality *gur*. In other words, we realise the necessity for special farms for demonstrations which involve industrial as well as agricultural operations. But, for demonstration of actual agricultural processes, we are of opinion that the demonstration plot is the most suitable.

As a rule, demonstration work should not be carried out on experimental farms. The conditions imposed by the experimental character of the work carried out on such farms are often of such a nature as to render the practices followed on them inapplicable to ordinary cultivators. There is, however, no objection to spare land on an experimental farm being set apart for demonstrations. We see positive advantages in seed farms being used as demonstration farms, provided the primary purpose of the farm is not detrimentally affected thereby. The seed farm affords special opportunities to the cultivator of seeing the extent to which the adoption of improved methods of cultivation or the use of manures can increase the outturn of the seed issued to him.

A question which is often discussed is whether departmental farms should pay their way. Farms which have been established solely

for experimental work cannot be expected to do so. Receipts are an entirely secondary consideration in their case. Seed farms should ordinarily be expected to be at least self-supporting as far as their seed work is concerned. Demonstration farms established to demonstrate the possibility of commercial farming would obviously fail in their purpose if they did not yield a substantial profit. Where district and tehsil farms are opened to further the general propagandist work of the department, they should not necessarily be expected to pay.

We consider that short courses in particular subjects for cultivators given on demonstration and seed farms form an excellent means of establishing closer touch between the agricultural departments and the cultivator. These courses should be carefully thought out and a particular member of the staff should be detailed to give them. The question of providing stipends or free accommodation to attract cultivators is a matter for local settlement.

Two systems of demonstration on the cultivator's own fields are in vogue. In the first, a plot is hired for the demonstration and the cultivation is carried on throughout by the departmental staff. In the other, the cultivation is carried on by the cultivator himself from start to finish under the close supervision of the agricultural demonstrator. The first method has the advantage that more reliance can be placed on the data which are collected in the course of the demonstration; the second that, as all the work is done by the cultivator himself, he is placed in a better position to realise the true value of the improvement which is being demonstrated. Both methods have much to recommend them and we consider that they might well be tried in all provinces and the results compared.

The question arises whether the cultivator whose land is used for the purpose of demonstration should be guaranteed against any loss which may result. We consider the policy of giving guarantees to be one of doubtful expediency. It may be necessary if, without it, demonstration plots are not procurable. Even if no guarantee is given, some compensation should, of course, be made if, for any reason, failure in the methods adopted has involved the cultivator in loss.

There is no respect in which the short courses, the establishment of which we have referred to, should prove of more value than in promoting the use of improved implements, more especially if they include instruction not only in the use of the implements but also in their repair. We also consider that much could be done to popularise improved implements by peripatetic demonstrations. The demonstrators, wherever possible, should take with them a supply of spare parts and should be accompanied by an instructor who would teach the village smiths how to fit new parts and make adjustments and repairs. The use of the more expensive implements and machinery might extend more rapidly if suitable arrangements for hiring them out could be made either by the agricultural departments or by the manufacturers in consultation with the departments. We also desire to emphasise the importance of agricultural shows. These should include

demonstration of such machinery and implements as are suitable for the tract in which the show is held and exhibits of livestock and produce. If these shows are to exercise their full effect in educating opinion among local cultivators, it is essential that they should be held year after year, if not in one centre, at least in the same part of the country. A permanent agricultural stall should also be a prominent feature of the regulated markets, the establishment of which we recommend in Chapter XI of the main Report (*see* page 44 below). The agricultural departments might also have suitable exhibits at the big fairs and festivals which are so common in India.

The publications of the various agricultural departments include vernacular leaflets, bulletins, journals and calendars while the departments in most of the provinces supply regular material to the English and vernacular press. The success of these publications depends primarily on the amount of literacy in the various provinces and we have no desire to lay down any general directions in this matter. We would, however, point out that vernacular leaflets are of little value unless they are issued in connection with a definite demonstration of their subject matter. We approve of publicity in any form where it is felt that it will be appreciated by the public. Our remarks with regard to vernacular leaflets apply also to lectures, with or without lantern slides, and to cinema demonstrations. Propaganda through these means will be of little value unless it is used in conjunction with an actual demonstration of results. With regard to cinema exhibits, an agricultural film is apt to fail in its purpose unless it has been carefully prepared by a producer with considerable knowledge of village life and of the mentality of the average villager. For this reason, the agricultural departments should consider the advisability of preparing their own films.

In this connection, we would mention an interesting experiment which has recently been made in Bengal and the Punjab. A demonstration train was fitted up as a travelling exhibition by the Railway, Public Health, Agricultural, Industries, Co-operative and Veterinary departments and carried out an extensive tour throughout these provinces. In addition to the exhibits of various departments displayed to the public, open air lectures illustrated by films and lantern slides were given at each stop. The possibility of such a demonstration train should, when the results of the Bengal and Punjab experiment are known, be considered by other provinces.

Of other methods of propaganda, agricultural associations, as originally constituted, have, for the most part, hitherto proved a failure. The area from which the members were drawn was usually too large to permit of a concentration of activity sufficient to produce any positive results. The lack of a definite task often meant that nothing at all was done. Members were frequently drawn from people whose direct interest in the land was small or the associations depended too much upon the enthusiasm of a single member, while the staff of the agricultural departments was too limited to enable them to give the associations the necessary close attention. In recent years, however, in Bombay and the Central Provinces many of them have been reorganised in the light of experience

and converted into active bodies. The tendency in the Central Provinces now is to develop the smaller unit, starting with the tehsils and working up to the circle and the district. An interesting development is in progress in Bombay, where taluka development associations and divisional boards of agriculture have been formed. This represents the most systematic attempt which has yet been made to co-ordinate the propaganda work of the agricultural and co-operative departments in respect of agricultural improvement. The idea is that, as soon as possible after the constitution of an association, a survey of the taluka is to be carried out by the agricultural and co-operative departments. Where such associations exist, they have taken over the work formerly done in the taluka by agricultural associations, co-operative development committees and similar bodies. The associations are mainly deliberative bodies and approve the programme of work in the taluka. Their main object is the demonstration of improved implements, improved seed and manures, but they do not undertake the demonstration of any improvements unless they have already been successfully demonstrated on the cultivators' own fields by the staff of the Agricultural Department. If an association asks for them, the services of a fieldman are placed entirely at its disposal by the Agricultural Department, the cost being met from the funds of the association. The funds required for the work of the association are provided by a capital fund raised by donations, by annual subscriptions from co-operative societies, individuals, and villages as a whole and by an annual grant from Government which at present is equal to the income from other sources up to a limit of one thousand rupees. The taluka development associations work under the supervision of divisional boards, consisting of two official and four non-official members, two representing the co-operative movement and two agriculture. The board is expected to meet at least once a quarter and to submit a report of its proceedings to the Director of Agriculture and the Registrar of Co-operative Societies. The board distributes the government grants allotted to the taluka associations, and controls the distribution of the portion of the government grant for loans to co-operative societies which was formerly in charge of the Registrar of Co-operative Societies. It undertakes the distribution of the discretionary grant for propaganda purposes which was formerly administered by the Director of Agriculture. It is also expected to advise local officers as to the way in which the policy laid down by Government or by the Director and the Registrar is to be carried out in their division. It discusses questions of general importance and brings to the notice of the department concerned such measures as it thinks should be taken for the economic advancement of the division. The Government of Bombay have laid down that the propaganda work of the Agricultural Department should be carried on as far as possible through co-operative unions where they exist and, where they do not, through isolated co-operative societies. A report on the work of all the propaganda staff is submitted to the divisional board by the departments concerned every quarter and is forwarded to the Director of Agriculture and the Registrar of Co-operative Societies with the board's remarks. Any recommendations made by the

board are considered and orders on them are issued by the Director and the Registrar jointly. We consider that this system provides a model which is worthy of study by other provincial governments. We are convinced that it is only by the adoption of this, or of some similar system, that the agricultural departments can effectively utilise the help of co-operative and other associations.

We have described the work of the taluka development associations in some detail because we consider that agricultural departments have, on the whole, failed to exploit the possibility of propaganda work through the co-operative departments. While this has been largely due to the fact that the co-operative movement in several provinces in India has not yet reached a stage at which it can undertake on an extensive scale any activities other than credit, there can be no doubt that lack of sufficiently close touch between the agricultural and the co-operative departments has been a contributory cause. The agricultural departments should make far greater use of the co-operative credit society in their propaganda work than they are now doing.

We desire to emphasise the importance of concentration in all demonstration and propaganda work. For this reason small units should be selected. Once an improvement has thoroughly established itself in the agricultural practice of a small area, the knowledge of it spreads naturally over contiguous areas where conditions are similar. In particular, concentration is necessary in regard to the distribution of the seed of improved varieties. An improved variety can thus more easily be produced in bulk and a premium for the quality more readily obtained from the trade. Similarly the subjects selected for demonstration should be strictly limited. The energies of the agricultural departments should not be dissipated.

Questions of demonstration and propaganda are of such importance that we consider that an officer of the standing of a deputy director of agriculture might well be attached to the office of the Director of Agriculture whose sole duty would be to organise and systematise propaganda work throughout the province. His task would be to watch the various schemes of propaganda in operation, to record their results and to suggest methods of making them more effective. He would be expected to familiarise himself as far as possible, with experiments in demonstration and propaganda in other provinces and in other countries, and generally to keep the research staff in touch with what was going on in the districts.

We consider that the propaganda work of departments concerned with rural welfare, other than the agricultural and veterinary departments, is best carried on through associations of a more general character than taluka development associations and agricultural associations.

We consider that a valuable stimulus to agricultural development in India would be given if the Government of India were to award an annual prize for the most striking agricultural improvement of the year. The conditions governing the award of the prize should be made as definite as possible and we would instance the invention of new or improved implements or the introduction of new or improved varieties of crops, as examples of the class of work which would constitute a claim to it.

V. ANIMAL HUSBANDRY

The latest statistics give the following figures for the different
CHAPTER VII or groups of livestock in British India.
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			Millions
Cattle and buffaloes	151·0
Sheep and goats	62·5
Horses, mules and donkeys	3·2
Camels	..	..	0·5

In the 66 Indian States for which statistics are available, there were, in 1924-25, over 36 million cattle and buffaloes, 25 million sheep and goats, one million horses, donkeys and mules, and 262,000 camels. In no country of the world are cattle of more importance than they are in India. Milk, though important, is a secondary consideration. The primary function of the cattle is as draught animals for the plough or the cart. Without the ox, no cultivation would be possible: without the ox no produce could be transported.

In spite of the wide differences between province and province, in physical features and in the numbers of the cattle, there seems to be a general similarity in India in the methods of management by cattle owners. A detailed study of a few closely settled districts suggests that the total number of ordinary cattle is primarily determined by the number of animals needed for work on the land. A comparison of the number of cattle kept in India with those kept in other countries indicates the possibility of reducing the number of working bullocks without necessarily reducing the existing standard of cultivation. There would, in fact, appear to be an excess in the numbers of the cattle necessary for cultivation if these cattle were efficient. The figures suggest the existence of a vicious circle. The number of cattle within a district depends upon and is regulated by the demand for bullocks. The worse the conditions for rearing efficient cattle, the greater the numbers kept tend to be. Cows become less fertile and their calves become undersized and do not satisfy cultivators who, in the attempt to secure useful bullocks, breed more and more cattle. As numbers increase, or as the increase of tillage encroaches on the better grazing land, the pressure on the available supply of food leads to still further poorness in the cows. As cattle grow smaller in size and greater in number, the rate at which conditions become worse for the breeding of good livestock is accelerated. For it must not be supposed that the food required by a hundred small cattle is the same as that needed by fifty of double the size. As cattle become smaller, the amount of food needed in proportion to their size increases. Thus large numbers of diminutive cattle are a serious drain on a country in which the fodder supply is so scarce at certain seasons of the year as it is in India. The process having gone so far, India having acquired so large a cattle population and the size of the animals in many tracts having fallen so low, the task of reversing the process of deterioration and of improving

the livestock of this country is now a gigantic one ; but on improvement in its cattle depends to a degree that is little understood the prosperity of its agriculture and the task must be faced.

Unless substantial changes in the existing management of cattle are introduced, a progressive deterioration in the quality of the cattle is to be feared. Four cardinal points in a policy of improvement must be (a) a reduction in the number of plough cattle ; (b) an increase in the efficiency of plough cattle ; (c) attention to all matters that would tend to decrease the number of bullocks required for cultivation ; and (d) an effort to secure better treatment for dry cows and cows in-calf.

The most important matter in connection with the maintenance of stock is the manner in which it is fed. In India, where stall feeding is little practised, the facilities for grazing are the principal consideration. It may be said that, in nearly every part of India the common grazing lands and all grass lands close to villages are generally hopelessly overstocked. The custom that an animal, if not working, should find its own food in the jungle when there is no fodder available on his holding results in the cultivator being unwilling to make any unusual sacrifice for the well-being of his cattle. The general position as regards cattle management may be summed up as follows. The ordinary cultivator does what he can for his plough cattle and his cow buffaloes ; quite often he does well for them, but bad seasons create difficulties for even the best cultivators, and the best of their cattle. The cow is less fortunate ; she gets little stall feeding and has to seek the greater part of her food where she can ; young cattle and the male offspring of her rival, the she-buffalo, share her fate and pick up their livelihood on common grazing grounds or by raiding crops.

It is only fair, however, to note that there are exceptions and that, where their treatment is good, many fine cattle belonging to a number of well recognised breeds are to be found. Amongst them the best known are perhaps the Haryana and Sahiwal of the Punjab, the Thar Parkar and Sindhi of Sind, the Kankrej of Gujarat, the Gir of Kathiawar, and the Ongole of Madras.

The two important factors in cattle improvement are feeding and breeding. We place feeding first because no outstanding improvement in the way of breeding is possible till cattle can be better fed. The crux of the situation is the period of scarcity which in most, though not in all parts of the country, is the two or three months preceding the break of the south-west monsoon. Since it is the curtailment of uncultivated land as population has increased during the past century that is the most obvious cause of the present overstocking of village grounds, it is not surprising that many witnesses have advocated the extension of grazing land. After an exhaustive survey of the possibilities, we are of opinion that no large additions to existing grazing areas are possible and efforts should therefore be concentrated on increasing the productivity of the land already growing grass. The scope for such efforts is very great. The productivity of the existing grazing grounds could be increased in the following ways :

(a) grazing on the common land could be regulated and rotational grazing established with the consent of the majority of those possessing grazing rights and by means of authority conferred on a group of villagers, for instance on a *panchayat* or co-operative society ;

(b) in some instances, a definite area of the common land could be separated off for a village co-operative cattle improvement society ;

(c) in hilly districts, where the grazing facilities are better than they are elsewhere, an attempt should be made to demarcate areas to be assigned at nominal rates to groups of occupiers of village lands on the following conditions :—

- (i) the area shall be grazed in rotation ;
- (ii) cattle not owned by the group shall be excluded ;
- (iii) part of the area shall be reserved for cutting grass for use in the hot season.

Where use cannot be made of natural grazing grounds owing to lack of water, the possibility of obtaining a supply should be investigated. In some parts of India, there may be considerable tracts of grass land which are not being fully utilised owing to lack of water.

As a supplement to, or a substitute for, natural grazing, the cutting and storage of dry grass is important. The possibilities of silage are also great, though the practice is attended by difficulties and has not been adopted by cultivators. Much propaganda is necessary. In many other directions, the fodder position can be improved. The use of the chaffcutter, the addition of cheap meal and condiments to make straw more palatable, harvesting at the right time so as to get full value from the straw, the encouragement of the growth of fodder crops are some of the lines for further trial and investigation. The cultivation of Egyptian clover (*berseem*) seems to hold out great possibilities if the seed can be cheaply grown in quantity in India. Every encouragement should be given to the cultivation of leguminous crops by the remission of charges for water from government sources of irrigation or by the grant of concession rates.

With regard to the improvement of cattle by careful breeding, the aim should be to establish pure and improved types of the best cattle now available and this should not be endangered by an attempt to produce a "dual purpose" animal suitable both for draught and for milking and *ghi* production. As a general rule to be followed in the breeding of draught cattle, we are of opinion that milking qualities should be encouraged only in so far as these are entirely consistent with the maintenance of the essential qualities which good draught cattle must possess.

Although government departments have now made a serious beginning with cattle improvement, very little progress has yet been made by government cattle farms towards meeting the total requirements for young bulls. As a general principle regulating such distribution, we commend for adoption elsewhere the policy pursued in the United Provinces of limiting the issue of breeding bulls to selected districts with a regular inspection both of the cows and their progeny and of the bulls placed out. We, therefore,

endorse the recommendation of the Bombay Cattle Committee of 1923 that intensive breeding operations should be conducted in selected areas. We consider the selection of areas and inspection of stock to be absolutely essential to securing any marked improvement from the issue of selected bulls from government farms.

The production of milk for urban consumers presents problems of great complexity. The cultivator, of course, uses milk and its products but for these he relies to a great extent on the buffalo. He is principally concerned with the cow as the mother of his bullock and attaches only secondary importance to its milking capacity. The essentials for a successful scheme of urban milk supply are a tract of country in which fodder is plentiful or can be easily grown, adequate arrangements for transport and a suitable type of cow. A cow for dairy purposes should average 5000 lbs. of milk during a lactation period and the aim should be to get an animal with an average of 8000 lbs. Improvement of indigenous breeds by selection is a safer policy for agricultural departments to pursue than cross-breeding and this process should also be applied to buffaloes. The supply of milk to urban consumers is at present most unsatisfactory. Municipal corporations of the larger cities, in addition to organising co-operative societies for the supply of milk should promote the establishment of large dairy farms and devise means by which capital and business ability may be attracted to large scale milk production.

As a rule, the control of livestock improvement should be entrusted to the agricultural departments but we do not recommend any change in the present arrangements in the Punjab where the Hissar farm has been in charge of successive veterinary officers with exceptional qualifications as stock breeders. When veterinary officers show a special aptitude for work on livestock improvement, they should be posted to livestock farms. Each major province should have a whole-time livestock expert.

At present, there is an Imperial Institute of Animal Husbandry and Dairying at Bangalore. This is divided into two sections, an animal nutrition section under a physiological chemist and a dairying and cattle breeding section under the Imperial Dairy Expert. The latter section, in addition to the farm at Bangalore, has attached to it farms at Wellington and Karnal, and a creamery at Anand in Gujarat. We consider that the staff of the animal nutrition section should be enlarged and that a scheme for a research institute for the investigation of animal nutrition problems should be prepared. There should be close touch between the staff of this institute and workers on the problems of human nutrition. In view of the fact that agriculture is now a provincial subject, we do not recommend the permanent retention of the dairying section of the institute nor of its cattle breeding stations with the exception of the station at Karnal which is well suited to become a centre for any cattle breeding experiments which may be required in connection with central research. Each province now has or will shortly have its own livestock expert. Cattle breeding problems are in the main local and it seems natural and proper that the

ordinary work of cattle breeding should be undertaken by the provinces themselves. Further we consider it the duty of the provincial colleges to provide instruction in dairying for their own students. Such research work of an all-India character as is necessary in connection with dairying could be conducted more advantageously at Pusa or some other scientific centre where chemical assistance is readily available, than at the Anand creamery. We do not recommend that these proposals should take effect till the present Imperial Dairy Expert retires. The three farms and the Anand Creamery should be retained until the enlarged nutrition institute has been established and the suggested changes at Pusa have been carried into effect.

As has already been noted, one of the members of the Council of Agricultural Research will represent the interests of animal husbandry. He should be an authority either in livestock breeding, animal nutrition or veterinary medicine. As he cannot be expected to be equally competent in all these three branches, arrangements should be made for *ad hoc* committees of experts under his chairmanship to deal with special questions.

VI. FORESTS

Forests are often described as the hand maiden of agriculture, and it is as such in their relation to the agriculturists' needs that we deal with them. They provide the cultivator with fodder for his livestock and with fuel and timber for his domestic consumption. The part which forests play in the protection of soils liable to erosion has also an agricultural bearing.

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Grazing in forests is permitted under the Forest Code on payment of certain fees or free of all charges. We consider that the replacement of grazing by grass cutting would, in many instances, be an improvement. But the present custom of grazing in forests will, for a very long time to come, be an important feature of forest economy. It, therefore, seems to us desirable that the intensity of grazing consistent with the proper development of forests and the preservation of desirable grasses should be determined as soon as possible.

The question of cut fodder is one which, at present, only comes into prominence at times of scarcity or famine. But with the improvement of the livestock of the country and the probable consequent development of stall feeding, cut fodder will assume an increasing importance. The possibilities of fodder supplies from forest areas should, therefore, be carefully examined both by the forest and the agricultural departments. Schemes should be devised for the improvement of grasses grown in forest and for the encouragement of grass cutting in preference to grazing. In this connection, the railway rates for fodder which can be transported are an important consideration and the railway administrations should offer the lowest rates for the transport of fodder compatible with their position as profit-earning concerns.

The next most important matter from the point of view of a cultivator is the provision of fuel and timber for domestic purposes. As is well known, the practice of burning cowdung cakes is very general in many parts of India and, in defence of this custom, it may be remarked that cowdung is at present the only certain supply of fuel which the great majority of cultivators can obtain. Before, therefore, this practice can be condemned or stopped, the possibility of supplying an alternative fuel must be carefully investigated. Fire-wood, charcoal and coal are the substitutes for cowdung cakes, but the cultivator must be convinced that it is cheaper for him to use one of these substitutes than to burn his manure. An investigation into the cost and efficiency of wood, charcoal or coal in terms of the loss to agricultural production by burning cowdung is urgently required. Into this question, again, enters the incidence of railway freights. We also realise that traditional custom will be a strong barrier to change of method. The breaking down of prejudice and the provision of an equally cheap and effective substitute are the essentials. The possibilities of afforestation for the increase of fuel supplies should also be thoroughly investigated.

We regard the development of forest industries as a matter of great importance to agriculturists, especially to those who live in the neighbourhood of forests, and we consider that a forest utilisation officer should be appointed in every province in order that their development may be made a definite responsibility of one officer.

At present, considerable damage is done to forests on hills in some parts of the country by the habit of shifting cultivation. The methods by which shifting cultivation in the Central Provinces has been gradually stopped appear to be worth studying by officers faced with this problem in other provinces. Where serious deterioration has taken place, the essential remedy in regions of heavy rainfall, that is, where the rainfall is over 60 inches, is protection against damage by cultivators and their goats and cattle in order to allow of natural regeneration. In tracts of light rainfall, there is no generally satisfactory remedy, but, in carefully selected areas, artificial regeneration might be possible though at heavy cost.

We consider that forest areas should be reclassified into areas most suitable for the growth of timber or for fuel plantations, or the preservation of which is desirable on climatic or physical grounds, those most suitable for development as fodder reserves or grazing grounds, and areas which should be handed over to ordinary cultivation.

The most promising method of establishing village forests is to hand over to village management certain more or less wooded areas now under the control of the Forest Department. Management by the people for the people of the forests close to their villages possesses so many desirable features that every effort should be made to ensure its success. We, therefore, recommend that, in each province, Government should aim at establishing two divisions within the forest departments, the officers in one division to be responsible for the charge of forests, the preservation of which is desirable on climatic or physical grounds and of commercial forests, that is of those forests managed with a view to direct profits from the sale of timber and other forest products; the other division to be in charge of minor forests, fuel plantations, village woodlands and waste-land, now chiefly used for grazing and often included under unclassified forests. Officers of this second division, in addition to the conservation of the natural resources of such areas, should be definitely charged with the responsibility of developing them and should be encouraged to make experiments in silviculture and in the improvement of grazing areas. Whether the minor forests division should continue under the Forest Department or be placed under the Revenue Department is a question for decision in the light of the local conditions. If the second alternative is adopted, the Revenue Department should have the advice and assistance of officers who possess a knowledge of forestry, more especially of silviculture.

To foster closer touch between the forest and agricultural departments, it would, as in the case of irrigation officers, be an advantage if short courses were instituted at the agricultural colleges for all newly

recruited forest officers. Further, a forest officer, before being posted to the new minor forests division, should, we consider, be attached for a period of not less than three months to the headquarters of the provincial agricultural departments with the object of making himself thoroughly acquainted with the view of the department as to the needs of the cultivators in the vicinity of the forests which he is to administer and in the province generally.

VII. DISEASES OF LIVESTOCK AND THEIR CONTROL

The working capital of the cultivator is mainly represented by his livestock and losses of his cattle from disease press hardly on him. The recorded figures, imperfect though they admittedly are, indicate that the annual number of deaths is very considerable and that rinderpest takes the largest toll. Apart from losses by death, extensive indirect losses occur from the large number of cattle temporarily incapacitated by disease. The more serious diseases of cattle in India are rinderpest, hæmorrhagic septicæmia and foot-and-mouth disease. The general prevalence of these diseases is probably one of the most serious obstacles to the improvement of cattle.

The outstanding problem which faces the civil veterinary departments, is thus the control of contagious diseases. The proposals we make in regard to the organisation of the departments, the training of their staff and the research they should undertake hinge on this. They will thus be more readily understood if we discuss the measures necessary to combat disease. We discuss rinderpest in detail because it is the most formidable disease of cattle in India and because the measures necessary to control it are typical of other contagious diseases.

Rinderpest was formerly the most dreaded of all livestock scourges in western countries. It is now non-existent. The inadequacy of the veterinary staff, the prohibitive cost of compensation combined with prejudices against the destroying of healthy animals which have been in contact with infected ones render the adoption of western methods impracticable in India. Nor is it possible to isolate and safeguard parts of India by interposing belts of protected country between permanently infected areas and areas from which the adoption of intensive measures has succeeded in eradicating the disease. In these circumstances and for the present, rinderpest and other contagious diseases must be combated by measures designed to protect the individual animal rather than by those which aim at stamping out the source of infection.

The method in general use at present for dealing with rinderpest is inoculation by what is known as the "serum-alone" method. The blood serum of an animal which has recovered from the disease is injected into cattle which it is desired to protect in doses proportionate to their body weight and their breed. Protection lasts only for a brief period. With the dose commonly used an animal is safe for a period of nine to fifteen days. Animals after protection by serum are allowed to mix freely with infected stock in the hope that they may contract a mild form of rinderpest and thus remain permanently immune, for, after recovery, an animal is immune from further attack. This "serum-alone" method is now very largely and effectively used in India in checking outbreaks of rinderpest.

The serum-alone method is, however, subject to the very serious limitation that it confers complete immunity for less than a fortnight whilst infection may persist in a village for a much longer period.

Animals are, therefore, liable to contract disease unless they are re-inoculated and, when they do so, the process is discredited in the eyes of their owners. Re-inoculation, on the other hand, is not only expensive but when an outbreak is widespread, is often impossible.

The principle on which protected animals are exposed to infection is sound but it would appear in practice that the chances that the disease will be contracted at the right moment are not good. To ensure infection, therefore, another process known as the serum-simultaneous, or active, method of conferring immunity has been devised. In this process a small quantity (from $\frac{1}{2}$ to 1 c.c.) of virulent blood taken from a diseased animal is injected into the animal at the same time that serum is used. A mild attack of rinderpest follows, the tissues of the animal prepare their own "antibodies" and an immunity which, in some instances, has been found to be permanent and, in others, to last for about three years is set up. The efficacy of the method has been proved in countries as far apart as Russia, South Africa and the Philippines while its success in Egypt is of particular interest to India. In India, only one experiment on an intensive scale has so far been made—in the Mysore State. Experience obtained there shows that the serum-simultaneous method is safe, effective and readily accepted by cultivators. Our examination of the evidence available as to the results obtained in India and in other countries from the use of the serum-simultaneous method of inoculation has led us to the conclusion that the introduction of this method is strongly to be recommended and that, indeed, it offers the only hopeful means of combating the ravages of rinderpest. Provided the materials used for inoculation are properly controlled, and the work of inoculation is carried out under the supervision of an experienced veterinary surgeon, careful to guard against such accidents as may occur, the risk involved is so slight that, in view of the great benefits incurred, it should be accepted without hesitation. We are aware that there are practical difficulties which, indicate the probability of some opposition from cultivators to the adoption of this method. In these circumstances, we consider that resort to compulsory inoculation would, at present, be undesirable. Cultivators should be given an opportunity of seeing what inoculation can do to protect their cattle before they are required to accept compulsory measures. To this, we would make one exception. We consider that compulsory inoculation by the simultaneous method should be enforced for all animals kept by milk sellers in large cities.

Outbreaks of rinderpest will supply favourable opportunities for popularising the use of simultaneous inoculation among cultivators and it may be hoped that co-operative breeding societies and cow-keeping societies will also show an example to the cultivator in this matter.

Experience has shown that when charges, however small, are made for inoculation, the extended use of preventive inoculation is greatly checked. We, therefore, recommend that all charges for inoculation, not only against rinderpest but also against other contagious diseases, should be abolished.

Rinderpest, although the most important, is only one of the serious infectious diseases to which India's livestock are liable. In discussing the measures which should be undertaken to deal with it, sufficient has been said to show that the suppression of epidemics must make large demands on the professional skill, the energy and the judgment of the officers in charge of the operations and that the type of education which such officers should possess is of a different order from that necessary for officers competent to deal with the diseases and injuries that are met with in ordinary veterinary dispensary practice. It will also be evident that to cope successfully with epidemic diseases, the number of officers employed by provincial governments must be largely increased. But as no staff, however large and skilled can be fully effective, unless Government have the power to control the spread of infection, we recommend that a Contagious Diseases of Animals Act should be passed with a view to ensuring a uniform procedure in dealing with contagious diseases. The Act should empower local governments to apply by administrative order to any tract such of its provisions as may be applicable in the circumstances of the case.

The provision of veterinary aid in India is at present totally inadequate. Apart from a few practitioners in the large towns, there are no veterinary surgeons in private practice in India. There are in civil employ about 32 veterinary surgeons in the Indian Veterinary Service and 52 in the provincial services whilst the number of veterinary inspectors and veterinary assistant surgeons in 1927 was about 1,400. Several of the superior staff are employed in teaching and other duties. Thus some 33 only are available for the control and treatment of disease and of this small corps of officers, less than one-half are licensed to practise veterinary medicine and surgery through possessing the diploma of the Royal College of Veterinary Surgeons.

These figures sufficiently show the inadequacy of the existing arrangements for controlling contagious diseases and attending to animals suffering from ordinary ailments and from injuries.

Veterinary aid is supplied by permanent dispensaries, by itinerating veterinary assistants or by both methods. We recommend the establishment in each district of a central veterinary hospital having accommodation for in-patients with a number of dispensaries serving subdivisions of the district. To meet the obvious shortcomings of the single dispensary serving a large tract of country, we recommend that the staff attached to dispensaries should be increased and men sent out to tour in the surrounding districts. The value of most veterinary dispensaries would, in this way, be more than doubled.

Our view is that the control of contagious disease must rest with the provincial Government whose staff, so far as is practicable, should consist of qualified veterinarians. The duty of providing a local veterinary service for treating diseases not scheduled as contagious and dealing with operations and wounds should, when the necessary arrangements can be made, rest with local bodies. It is in the light of this

distinction that we proceed to frame our proposals for the future organisation of the veterinary departments.

The first necessity is a very substantial increase of veterinary officers of all grades. The aim should be to provide at least one veterinary assistant surgeon for every 25,000 cattle and one qualified veterinary surgeon for each district, who would have on an average about 600,000 cattle, in addition to other livestock, in the area under his charge. There are 272 districts in British India, so that, on this basis, the number of Provincial Service officers required would be in the neighbourhood of 300, allowing provision for leave reserves. The number of veterinary assistant surgeons would roughly be increased fourfold, that is, to about 6,000 officers. The co-operation and assistance of Indian States would also be necessary. If their staff were on the same scale, the total number of qualified veterinary surgeons in the employment of Government and that of Indian States, including the staff of the veterinary colleges, and officers employed in supervising duties, would be over 400 and the total number of veterinary assistant surgeons about 7,500.

The organisation which we would therefore propose is as follows. In each province there would be a Chief Veterinary Officer, who might be styled Director of Veterinary Services. He would be in administrative control of the veterinary work in the province. The principal of the veterinary college should stand in the same relation to the Director of Veterinary Services in the province as the principal of an agricultural college to the Director of Agriculture. The posts of Director and Principal should be scheduled as selection posts outside the cadre of the provincial veterinary services. It is most important that the holders of these posts should be officers of ability and strong personality and, if need be, the provincial Government should be prepared to recruit an officer from outside the country. The rate of pay attaching to both posts should be reconsidered.

Under the Director of Veterinary Services in each province there would be deputy directors in charge of circles. These officers would be members of the present Indian Veterinary Service or of the new superior provincial veterinary services. Ordinarily vacancies in the latter service will be filled by promotion from members of the existing provincial veterinary services. The duties to be performed by the deputy directors will be responsible and vacancies should be filled by direct recruitment whenever an officer with the requisite abilities is not available from the existing Provincial Service. We suggest that an appropriate scale of pay for the new superior provincial veterinary services would be the existing scale of the Indian Veterinary Service. Underneath these administrative officers would be qualified veterinary surgeons, members of the provincial veterinary services and the aim should be to provide a qualified veterinary surgeon for each district. The primary duty of these services would be the control of epidemic disease but it would also be entrusted with the supervision of dispensaries and of touring veterinary assistants. The present scale of pay of the provincial veterinary services, Rs. 250 to Rs. 750 per mensem seems adequate. Beneath

this grade would be the subordinate veterinary services consisting of veterinary assistant surgeons in charge of the veterinary dispensaries and the veterinary work in the area commanded. The grade of veterinary inspectors, where it exists, should be abolished when the duties of inspection can be taken over by duly qualified veterinary surgeons. We do not recommend the complete provincialisation of the Veterinary Department. The subordinate veterinary services will continue, as at present, to be lent by Government to local boards. Progress in the direction of transferring greater responsibility to local bodies in veterinary matters, though desirable, will have to be made more gradually. When the complete control of the veterinary work, apart from that connected with the control and prevention of epidemic diseases, is entrusted to them, the assistance given by local governments to their branch of veterinary aid should take the form of a conditional grant-in-aid which might be given on a *pro rata* basis. It should be made a condition of the grant-in-aid that local bodies should look to the provincial veterinary services for advice and inspection and should consult the Director of Veterinary Services in regard to all appointments. In the mean time, local bodies should be consulted in regard to appointments, transfers, promotions, punishments, and dismissals of veterinary assistants employed in their dispensaries.

When the complete control of the veterinary assistant surgeons employed by them passes to the local boards, it will be necessary to create a veterinary reserve corps of selected veterinary assistants to deal with contagious diseases. Experienced veterinary assistants would be selected for membership of this corps by arrangement with the local bodies under which they are working. This, it is hoped, will render it possible to deal effectively with contagious diseases without interfering with the work of the dispensaries.

For the training of veterinary surgeons, that is the provincial veterinary services and the assistant veterinary surgeons, two entirely distinct courses of study are required with different entrance requirements and different classes at all stages. The framing of a suitable curriculum for the training of the latter class in the existing veterinary colleges should be referred to a body of experts. Special prominence should be given in the course to the anatomy and the diseases of cattle. For the provincial veterinary services, that is, for the district veterinary surgeons, the course which should be settled by conference between the university and veterinary authorities concerned, should extend over a period of five years from matriculation and should end in a degree. We do not recommend the establishment of an all-India veterinary college nor the expansion of the Muktesar Institute as an educational centre. We consider that the most satisfactory method is to train candidates for the provincial veterinary services in all provinces at one of the existing veterinary colleges. The additional expenditure involved in adapting the selected college to undertake higher veterinary education should be met by the Government of India. A short period at Muktesar should be included in or supplement the course at the selected college. We

recommend that the course of training for the provincial service should at present be limited to candidates nominated by the Government of India, provincial governments or Indian States, and that they should receive suitable stipends from the authority nominating them during their period of training. Officers on the teaching staff of the veterinary colleges should be expected and encouraged to undertake research work. In order to carry out successfully the training of the greatly increased number both of veterinary surgeons and assistant surgeons which our proposals require, it is most important that the principals and the staff of the colleges should be picked men. The staff should form part of the new superior provincial veterinary services. As a rule, special recruitment will be necessary but officers in the ordinary line of the Indian Veterinary Service and the new superior provincial veterinary services should be eligible for appointment. In order to secure officers with the requisite qualifications, it may be necessary to give special pay personal to the individual officer and based on his qualifications and experience.

At present, veterinary research is mainly concentrated at the Imperial Institute of Veterinary Research at Muktesar. We consider that this Institute is all that is required to deal with general problems of veterinary research and that any extension of central research in the immediate future should be provided by such additions to the staff and equipment of Muktesar as the nature of the work contemplated may call for. The Director of the Institute should be selected for his scientific qualifications and should be a man of outstanding position in the profession. As the number of superior posts at Muktesar is so small, we do not consider that any advantage would be gained in present conditions by the formation of a Central Veterinary Service. When an appointment, including that of Director, falls vacant, the officer recruited to fill it should be given a scale of pay in accordance with his special qualifications and experience. In view, however, of the very heavy administrative work which the manufacture of the various sera and vaccines involves, we consider that the Director should have attached to him, an officer with administrative experience to relieve him as far as possible of administrative detail. It is also important that an Institute such as Muktesar should have a thoroughly competent staff for secretarial work and estate management. The expenditure on research in Muktesar should be separated as far as possible from that on manufacturing operations and we consider that the provinces and States should share in any profits from the manufacture of sera and vaccines in proportion to their purchases. We recommend that the administrative control of the Muktesar Institute, at present vested in the Agricultural Adviser to the Government of India, should pass to the Director of the Institute, whose position, *vis-a-vis* the Muktesar Institute on the one hand and on the other the Council of Agricultural Research, would be precisely that of the Director of Pusa to his own Institution and to the Council.

The Council of Agricultural Research should have a small Standing Committee to deal with veterinary matters with powers

to co-opt members and constitute special committees for particular subjects. In these circumstances, we do not consider that the revival of the Inspector General of the Civil Veterinary Department or the creation of a post of a Veterinary Adviser to the Government of India is necessary.

VIII. IRRIGATION

The Report of the Irrigation Commission of 1903 was so comprehensive and its recommendations so exhaustive that no further enquiry of a similar character has been considered necessary. Irrigation policy and development have followed, in the main, the lines laid down by the Commission. Our concern with irrigation is purely from the agricultural point of view.

The part which irrigation plays in the rural economy of the different provinces varies greatly from province to province, but it is of chief importance in Sind, the Punjab, the North-West Frontier Province, Madras, the United Provinces and Bihar and Orissa. On an average, for the five years from 1921-22 to 1925-26, nearly 50 million acres were irrigated by government and private irrigation works, the percentage of irrigated area to area sown being 19·4. Practically half the total area irrigated is irrigated by canals, the remainder being irrigated by tanks, wells and other sources.

We do not describe in detail the existing canal systems of India but indicate some of the principal projects in hand or contemplated. The very brief description which follows must not be regarded as in any way indicating a preference on our part for a particular scheme.

In the Punjab, where the area under irrigation from government works has steadily increased from 2·3 million acres in 1887-88 to an average of 10·4 million acres from 1921-22 to 1925-26, the possibilities of further expansion are far from exhausted. The Sutlej Valley project, which is the only large project at present under construction in the Punjab, will, when completed in 1933-34, provide perennial irrigation for two million acres. But other great schemes are under consideration. The Thal project, even in its revised form, would command an area of nearly a million-and-a-half acres. The Haveli project would bring perennial irrigation to an area of about 700,000 acres. The Sutlej Dam project would add two million acres of *rabi* cultivation between the Sutlej and the Jumna rivers.

At present, the existing canals in Sind are almost entirely of the inundation type. They only obtain water for some five months when the Indus is in flood and this only in fluctuating quantities. The construction of the Sukkur Barrage across the Indus just below Sukkur which, when completed, will be the greatest work of its kind in the world, will entirely change this. It is anticipated that it will irrigate over five million acres of which two million acres are at present very unsatisfactorily irrigated from the existing inundation canals.

In the United Provinces, the Sarda Canal is the only project of importance under construction. This will, it is estimated, irrigate annually an area of about 1·7 million acres. On its completion, all the principal available resources for perennial irrigation in the United Provinces will have been tapped.

In Madras, the great irrigation systems, the Godavari, the Kistna and the Cauvery differ completely in character from those already described. The problem has been to regulate the supply rather than to extend it to new areas. The works consist of weirs by which a sufficient head of water is obtained to irrigate the lands of the deltas and of sluices and regulators by means of which the water is conducted over these lands. The new works under construction or consideration are storage reservoirs to impound the water of the great rivers of the province, their tributaries and other streams, with a view to supplement the existing supplies. The Cauvery-Mettur project, at present under construction, will, it is estimated, improve the supply of an area of a million acres already irrigated and bring under irrigation a new area of 221,000 acres of first crop and 90,000 acres of second crop, while it will also supplement supplies in an existing wet area of 80,000 acres now inadequately irrigated. Two projects which have long been under consideration are the Kistna and the Tungabhadra projects. Attention is now being concentrated on a revised scheme for impounding the waters of the Tungabhadra by the construction of a reservoir at Timmalapuram in the Bellary district. This would provide water for a wide extension of irrigation in tracts very liable to scarcity. We are not in a position to express any opinion as to the feasibility of either of these projects from the financial or the technical point of view.

In Bombay proper, as distinguished from Sind, irrigation by canals is confined to the Deccan and (on a very small scale) to Gujarat. The most important works are of the reservoir type: the Khadak Wasla Dam across the Mutha river, ten miles above Poona, which was completed in 1879, being the first work of its kind in India. The object of irrigation in Bombay proper is mainly protection against famine and only about 450,000 acres are irrigated from government works. With a very few exceptions, there is a heavy annual loss in their working. This is the more unfortunate as the rainfall of the Western Ghats which they utilise is unfailing. The most important new work of this kind is the Lloyd Dam at Bhatgar intended to protect a part of Sholapur district which is specially liable to famine and also to improve existing irrigation.

Next to canals, wells are the most important source of irrigation and, during the five years ending 1925-26, they have on the average irrigated annually over eleven million acres. These wells are of all kinds varying from mere holes in the ground to elaborate masonry structures of great width and considerable depth or tubes of small bore, from which by power pumping, large and continuous supplies of water can be obtained. Well irrigation is most highly developed in the United Provinces where over 4½ million acres are irrigated from them. Tanks are the third great source of irrigation. These range from storage reservoirs, the distributary channels from which irrigate several thousand acres, to small works irrigating only a few acres. They are of special importance in Madras.

Since the introduction of the Reforms, local governments are in a position to raise the funds required for protective irrigation schemes by

loans if they are unable to finance protective schemes of irrigation from current revenues or from the Famine Insurance Fund which they are bound to maintain. We trust that, so far as the financial situation may allow, this may encourage the construction of further protective works.

The problem of preventing the waste of irrigation water, of securing greater certainty to the cultivator as to the supply he will receive and of relieving him from any harassment and interference from the staff which records his irrigation has long engaged the attention of irrigation experts in India. The Indian Irrigation Commission took the view that it would be of great advantage both to Government and the cultivators if the latter could be induced to take over their supplies at the outlets, to arrange all details of internal distribution between themselves and to relieve the canal administration of all further responsibility and of the great expense of recording the details of the irrigation and of making the final measurements and assessments. They concluded, however, that the system of charging by volume could not be safely introduced in India until a system of distribution by modules of the type which it might be proposed to use had been in force for a time sufficiently long to enable the people to understand what was proposed. They held that, even then, the change in the system of assessment should not be forced but should be introduced gradually, as the people learned to appreciate its advantages. They added that it was an end to be aimed at and that irrigation officers should be encouraged to design and experiment on modules which would be suited to the conditions to be met with in practice, until the work of distribution could be carried out with all the regularity and certainty which were essential to the success of any scheme of charging by volume. These recommendations of the Irrigation Commission marked the starting point of investigations into the possibility of more scientific and equitable distribution of water. Much progress has been effected in recent years in the improvement of the system of distribution. Every distributary in the Punjab has been, or is being, fitted with a meter so that the exact amount of water passed into it is known. By this means, considerable economy of supply has been effected, enabling irrigation to be extended to areas for which water was not previously available, and the opportunities of harassment and interference by the subordinate staff have been greatly reduced. But irrigation engineers display some scepticism as to the possibility of the sale of water by volume. Many arguments against this system were brought before us but we consider that further investigation and experiment are eminently desirable before a final decision against the sale of water by volume is reached.

Even under the area system of distribution, some cultivators make their water go much further than others. No reduction in the supply of water should be made solely because water has been economically used.

It was suggested to us by several witnesses that the distribution of water should be transferred from the Irrigation to the Agricultural Department. We see no advantage in this proposal. We are of opinion that there is, at present, no practical alternative to the system

of government control over distribution down to the field distributaries. There can, however, be little doubt that the general introduction of the sale of water by volume would greatly facilitate the substitution of private for official management of the minor distributaries. Irrigation *panchayats* for management of field distributaries seem to be a suitable organisation for obtaining collective action and fair dealing amongst cultivators. At present, the fundamental obstacle to entrusting distribution of water to private agency is the attitude of the cultivator himself. Water is so vital a thing to him that he is not yet prepared to leave his interest in this matter to the decision of his fellows. The group spirit which the *panchayat* would create might remove these difficulties and develop the mutual confidence necessary for the successful management of the larger distributaries.

Apart from the great irrigation schemes, smaller storage works and minor sources of irrigation are in certain tracts of great importance to cultivators. In Bombay, particular attention has recently been paid to this subject and, in 1925, a superintending engineer was placed on special duty to investigate natural resources for the protection of lands from famine. We are of opinion that much could be done to promote the development of minor works if the example of the Bombay Government were followed in other provinces and we would also suggest that the operations in Bombay should be extended to districts outside the insecure tracts. What is wanted in our view is an agency to which the cultivator who wishes to improve his land by utilising the natural sources of water supply can turn for technical advice and assistance. This agency should not wait for the cultivator to consult it, but should go to him and urge him to adopt the scheme best calculated to utilise his available water supply to the fullest advantage. The personnel should regard its function as educative rather than purely advisory. We, therefore, recommend that the construction and maintenance of minor irrigation works should be entrusted to a special agency.

Irrigation from tube wells is a comparatively recent development in India. They are almost entirely in private ownership and are privately financed, except in the United Provinces where substantial grants are given for their construction. Loans under the Land Improvement Loans Act are, of course, available for the purposes of sinking tube wells. Technical advice and assistance are freely given by the government department concerned and the well is, in fact, usually installed by that department subject to the payment of moderate fees for services rendered. In the United Provinces, an elaborate system of subsidy exists, the effect of which is that nearly one-half the cost is borne by Government. In addition to the assistance thus given, zamindars who undertake to multiply seed for Government or to lease land to Government for demonstration purposes may receive, in special cases, grants-in-aid up to a maximum of Rs. 3,000. We understand that, in practice, such grants are invariably applied for and are given at the maximum rate. We see no justification for the system of subsidies which has been adopted in the United Provinces and recommend that it should be terminated.

We consider that the department entrusted with the charge of pumping and boring operations should make detailed investigations into the economics of tube well irrigation and should also carry out a systematic survey of the subsoil water supplies. Government responsibility for the development of such irrigation should be limited to the supply of economic data, expert advice, and finance, where required, on the *taccavi* system. Government assistance may also include placing at the disposal of the landholder the boring equipment and skilled labour necessary on payment of a reasonable fee in tracts in which the scope for tube wells is limited or in which they are still a novelty ; but, in general, private enterprise in such matters should not be discouraged by government competition. We are of opinion that pumping and boring operations should be entrusted to the agricultural departments.

The area irrigated by ordinary wells in British India is practically stationary. Construction of such wells is essentially a matter for private enterprise, but there are many ways in which the agricultural and irrigation departments can help the landholder. The agency for minor irrigation works which we have recommended and the engineering section of the agricultural departments should be able to give much technical assistance. In tracts where holdings are very small and where the construction of a well is beyond the capacity of the individual, every effort should be made to encourage co-operative sinking and working of wells. In some parts of India, the number of abandoned wells is large and we would suggest that, where this is the case, a special enquiry should be made by the Revenue Department into the reasons why the wells have fallen into disuse.

In addition to irrigation by canals, wells and tanks, numerous temporary *bunds* for the storage of rainfall are constructed each season and water is obtained by lift from rivers and streams. In the aggregate these various subsidiary sources of irrigation are important as they supply over ten per cent of the total irrigation. We consider that there is a wide field of opportunity here for the branch of the agricultural engineering department responsible for pumping operations to devise cheap and efficient pumps and to induce private enterprise to undertake their multiplication and to provide a repairing service for them.

It is clear that the relations between the agricultural and irrigation departments should be of the closest as they are so intimately concerned with the problems of land improvement. We are of opinion that the views of the Director of Agriculture should be obtained at an early stage on the agricultural aspect of all new irrigation schemes, that there should be frequent consultations between the heads of the agricultural and irrigation departments and that their views should be formally on record. Further, in order that the officers of one department may have some acquaintance with the problems of the other, we recommend that short courses on agriculture for irrigation officers and on irrigation for agricultural officers should be instituted.

In order that the cultivators, for the furtherance of whose interests the Irrigation Department exists, should have a more direct avenue of

approach to the responsible officers of the department and to Government, we would suggest the creation, in those provinces in which irrigation is of importance, of an organisation on the analogy of the local railway advisory committees composed of representatives of the irrigation, revenue and agricultural departments with a majority of non-official members who should, if possible, be cultivators. The main duty of this advisory committee would be to deal with complaints from cultivators or associations of cultivators in regard to irrigation matters.

The Government of India have recently constituted a Central Irrigation Board of which the Consulting Engineer to the Government of India and all the chief engineers for irrigation in the provinces are members. The Board will work through sub-committees consisting of those engineers with recent experience of works akin to those to be discussed. These sub-committees will be convened by the Government of India at the instance of the local Government concerned when a new project is about to be sanctioned or when a province finds itself in difficulties in any technical matter. In addition to this Central Irrigation Board, we propose the establishment of a Central Bureau of Information for Irrigation which might suitably be placed in charge of the Consulting Engineer to the Government of India with its headquarters at Delhi. The main functions of the Bureau would be to establish and maintain a comprehensive library of irrigation publications and to act as a clearing house of information needed by provincial officers. It should endeavour to keep agricultural officers and the public generally in touch with irrigation developments in India and abroad. We also recommend annual or biennial meetings of irrigation engineers to be held in rotation in different provinces and in localities which possess features of special interest to the irrigation engineer. We also consider that provision for research on irrigation problems should be made in all provinces in which irrigation is of importance. The matters for investigation would include the distribution and application of water required for crops, the question of waterlogging, drainage and lining of canals. The scientific staff of the Indian universities might assist in the solution of irrigation problems for which geological, chemical or mechanical knowledge is required. We do not consider that a case has been made out for the establishment of a central station for irrigation research. The work of provincial stations engaged in such research should, however, be reviewed from time to time by a committee appointed by the local Government in consultation with the Central Board of Irrigation and the Council of Agricultural Research.

Many of the troubles which have arisen in the irrigated tracts of India in regard to waterlogging and the formation of alkali lands have been due to failure properly to correlate a new irrigation system with the natural drainage of the tract. We, therefore, consider that drainage maps should be drawn up by competent engineers who possess the necessary agricultural insight. Once these maps have been made it will be easy to control all such undertakings as the construction of roads, railways, canals and embankments and to see that nothing interferes with crop production.

Questions arising out of the great extension of irrigation in Sind as the result of the construction of the Sukkur Barrage are dealt with in detail in the main Report, as also are questions specially affecting the North-West Frontier Province and Baluchistan. As these questions, though important, are of local interest, they need not be referred to here. For the same reason we do not mention the problems peculiar to Bengal which are also dealt with in the main Report. These are so complex in their character and their solution is of such importance to Bengal that we consider that a committee of experts should be appointed to investigate them.

In regard to hydro-electric development, it is to be noted that the natural reserves of water power available in certain parts of India are considerable. In existing conditions, we consider that the immediate openings for electric power for agricultural purposes are confined to pumping schemes. Information required in connection with hydro-electric development should be supplied by the Central Bureau of Information for Irrigation. In view of the highly technical nature of the subject, expert advice in regard to any particular scheme of development should be obtained from a firm of consulting engineers.

IX. COMMUNICATIONS AND MARKETING

Good communications are of great importance to the cultivator for on them largely depends his opportunity for the favourable marketing of his produce. It is the improvement in communications since the middle of the last century that, more than any other factor, has brought about the change from subsistence farming to the growing of money crops such as cotton, jute and groundnuts. But good communications also react upon every aspect of the cultivator's life for the closer connection which they create between the villages and the towns must stimulate the more backward rural community to demand a higher standard of education as part of a higher general standard of living. They also induce interchange of ideas and so broaden the cultivators' outlook on life. The mileage of railways and roads in India is rapidly expanding. All roads, except those of military importance, are a transferred subject in the major provinces. In Bengal, practically all the roads are under the district boards, who meet the entire cost of construction and repair from the roads and public works cesses. In Madras also, roads with few exceptions, are in charge of the local authorities but they receive substantial financial assistance from provincial revenues. In other provinces, except in the Punjab, roads fall into two classes, those of provincial importance which are maintained by the Public Works Department and local roads which are maintained by local bodies. Roads in the Punjab have been classified very systematically. Class I roads form the arteries of the road system and are maintained by the Public Works Department. Class II roads are those which pass through more than one district or connecting important places. These are in charge of the district boards but the expenditure on them is shared by government and local funds. Other roads fall in class III. In all provinces, village roads, that is, roads connecting villages which are not on any through line of communications with the road system of the district are almost entirely a matter for the villagers themselves. Such roads are often mere tracks that can only be used during dry weather.

The evidence we received shows that the condition of the roads in India has deteriorated in recent years, and that the rapid expansion of motor traffic has brought into existence an entirely new range of problems of road construction and maintenance. This new factor has led to the recent appointment by the Government of India of a Road Development Committee, consisting of fourteen members of the Central Legislatures, which is investigating the whole question of road development in India. The concern of this Committee is primarily with the development of the main roads, but we would emphasise the importance of subsidiary communications which are of even greater concern to the cultivator. His village must be linked up with the main arterial roads if he is to get the advantage of good communications.

Road boards have been established in some provinces. Their functions are in the main advisory and it is only in the Punjab and Burma that they have wider functions and have embarked upon an ordered

programme of road development. We recommend that road boards with powers similar to those which have been given to the boards in the Punjab and Burma should be constituted in all provinces.

In the administration of their road policy, local boards are very much handicapped by lack of funds and we consider that local governments might give liberal financial assistance where a well-devised scheme has been thought out. The matter is of such importance that we would recommend flotation of loans for this purpose rather than that expenditure should be met from current revenues. There is, unfortunately, always a danger that main roads will receive a disproportionate amount of attention. Liberal grants-in-aid should be given from provincial revenues for the construction and improvement of village roads, although improvement of such roads must in the main depend upon the efforts of the villagers themselves. To this end, co-operative action on their part should be encouraged. All district boards should have the services of a qualified engineer.

It is desirable that, in the development of communications generally, railways and roads should be regarded as complementary to each other. Roads should be designed to serve rather as feeders to the railways than as competitors for traffic. Railway freight rates are frequently criticised from the point of view of the agriculturist. We do not accept the view that rates are generally too high, but we suggest a periodical revision of rates with a view to the adjustment of their incidence as between various sorts of produce. We consider it desirable that closer co-operation between the railway and agricultural departments should be secured by the appointment of the Director of Agriculture or the Marketing Officer in each province as a member of the local advisory committee on railways.

With regard to water ways, the only point brought prominently to our notice was the extent to which their use is hampered by the spread of water hyacinth in Assam, Bengal and Burma. Various attempts have been made to deal with this pest but with indifferent success. Further research is urgently needed and, as the problem affects a number of provinces, we consider that a programme of work should be formulated by the Council of Agricultural Research so that concerted action can be taken simultaneously in all the provinces affected.

MARKETING

The agricultural departments in India have done much to improve the quality and to increase the quantity of the cultivator's outturn but it cannot be said that they have been able to give him substantial help in securing the best possible financial return for his improved quality and his increased outturn. This is the only inducement that can be held out to the cultivator to adopt improved seed and he is not likely to take much trouble if he finds that he cannot get a better price for his improved produce. For this comparative indifference to quality, the middleman may in part be responsible as he is inclined to buy rather in quantity than in quality, and it is only when an improved variety

has been grown over a large concentrated area that a reputation for quality can be obtained and a premium price commanded. There is great absence of information with regard to marketing conditions in India. In all provinces markets vary greatly in character and importance. Some are privately owned; some are directly under the control of the district board or municipality. It is only in Berar that the constitution of markets is regulated by special legislation and that the management is in the hands of elected committees. An act for regulation of cotton markets in the Bombay Presidency has recently been passed but has not yet come into operation.

In all provinces we received complaints of the disabilities under which the cultivator labours in selling his produce in markets as at present organised. It would be unfair to ascribe these entirely to the middleman. It must be recognised that the middleman fulfils essential functions and that it is not possible to dispense with him. That abuses exist and that some of these can be remedied or removed is, however, beyond dispute.

The most hopeful solution of the cultivator's marketing difficulties seems to lie in the improvement of communications and the establishment of regulated markets, and we recommend for the consideration of other provinces the establishment of regulated markets on the Berar system as modified by the Bombay legislation. The establishment of regulated markets must form an essential part of any ordered plan of agricultural development in this country. The Bombay Act is, however, definitely limited to cotton markets and the bulk of the transactions in Berar markets is also in that crop. We consider that the system can conveniently be extended to other crops and, with a view to avoiding difficulties, would suggest that regulated markets should only be established under provincial legislation. Local governments should also take the initiative and such markets should immediately be established in a few principal centres. Only in this way will public opinion be educated to realise the advantages of markets of this character and a demand for them be created. The relationship of a regulated market to the council of any municipality or to the local board in the area in which the market is being established will require careful consideration in drafting legislation.

We consider that the management of these markets should be vested in a market committee. This committee should contain adequate representation of the actual cultivators in the areas served by the market and, if their interests are not adequately safeguarded, an official of the agricultural department might well be nominated to the committee to protect them. It is undesirable that any licensed broker should be eligible for election to the committee as a representative of the cultivator. Provision should be made for the representation on the committee of co-operative societies in the area served by the market. The addition to the committee of nominated members should not be allowed to reduce the actual trade representatives below a certain limit. The committee should elect its own chairman. Details of the

working of this committee must be left to local decision, but we would suggest that in order to prevent fraudulent weighment, they should instal a weighbridge in the market with suitable arrangements for its use, and that machinery should be provided for settlement of disputes which arise. For this purpose a board of arbitration consisting of three members, one nominated by the buyer, one by the seller and a third who would be chairman, selected by both the parties from the market committee, would seem to be the most satisfactory arrangement. Market committees should charge themselves with the duty of posting prices, ruling in the market centres of the tract and at the ports, for the products dealt with in the market. They would frame rules for the control of brokers, especially for preventing them from acting for both buyer and seller, and might provide limited storage accommodation in the markets.

A question which has for long engaged attention is the standardisation of weights and measures. These vary most extraordinarily throughout the country and, in some provinces, almost from village to village. Although a committee to investigate this subject was appointed by the Government of India in 1913, no action has yet been taken on its recommendations. We consider the matter of such importance that we would recommend that the Government of India should again undertake an investigation into the possibility of standardising weights and measures throughout India and should lay down general principles to which provincial governments should adhere so far as this is possible without undue interference with local trade custom. A Bill to provide standards of weights and measures for use in Burma has been introduced in the local Legislative Council. A feature of the Bill is the power which is taken to recover from the villagers the cost of equipping village committees with standard weights and measures by the imposition of a tax or a cess on lands assessed to land revenue. It is explained that the reason for this provision is that the total expenditure involved in a free supply at the cost of Government would be considerable; and that the share of each village, if the cost is distributed over all villages, will be very small and its collection will do more than anything else to advertise the fact that standard weights and measures have been provided.

Much of the Indian produce exported to foreign markets would appear to be marketed in an unsatisfactory condition though matters have considerably improved within recent years. In England, we were informed that cotton is badly mixed, that jute is badly retted and graded and suffers from excessive moisture, that Indian hemp is very irregular in quality, badly mixed and contains an excessive proportion of dust and dirt. On the other hand the report on Indian oil-seeds, with the exception of groundnuts which frequently suffer from excessive moisture, was satisfactory. Opinion on the quality of Indian wheat was divided; in view of the possible expansion of the crop in Sind and in the Punjab as a consequence of the Sukkur Barrage and the Sutlej Valley project, we think that the possibilities of developing an export trade in high class strong wheats should be borne in mind. The buyer is the ultimate judge of the quality to which he gives a value by an increased or decreased

price. Organisation amongst the ultimate buyers can, in some instances, be an effective weapon in securing improved quality but it is difficult except in such a case as that of wheat in which the greater part of the exports from India go to one country. Effective measures to secure improved quality must, therefore, in the main be applied by the agricultural and co-operative departments who must keep in close touch with trade requirements so that the cultivator may get the benefit of his better cultivation and better methods of preparation. Organised trade associations such as the East India Cotton Association who are in a position to lay down grades and standards can give great assistance. Co-operative sale societies should be encouraged as these furnish the best means of enabling the cultivator to secure an adequate premium for produce of superior quality. The agricultural departments can substantially assist the co-operative sales societies by grading their produce. Auction sales by agricultural departments provide a useful means of securing to the cultivator in the early stages an adequate premium for the superior quality of a new variety grown under their supervision. Such auctions should, however, be only continued until they can be taken over by co-operative societies or suitable private agencies.

We do not consider that further investigation is called for into the possibilities of grain elevators. An elevator system would have to be financed by Government and the advantages to the cultivator appear altogether too problematical to justify this.

The marketing of his produce is such an important matter from a cultivator's point of view that we consider that an expert marketing officer should be appointed to the staff of the agricultural departments in all the major provinces. One of his first duties will be to organise market surveys. There is a great lack of exact information on the subject and this must be obtained and studied before Government can work out a scheme to assist the cultivator in his marketing operations.

One of the specific duties of the marketing officer will be to examine the working of the regulated markets, and to make recommendations for their improvement where necessary. He would advise the market committees on any points that may be referred to him.

In view of the growing importance of Indian agricultural products in Europe, we consider that the Indian Trade Commissioner in London should be given the assistance of an officer with experience of agriculture and co-operation in India. The main duties of this officer would be to keep in touch with all aspects of the trade in Indian agricultural products at the European end and with all developments of co-operation in Europe. An officer of similar standing and experience should be attached to the staff of the Director General of Commercial Intelligence in Calcutta, who would pass on to the departments concerned information which he receives from his colleague in Europe, in a manner which would enable them to utilise it to the best advantage. Ultimately, as Indian trade grows, it may be necessary to appoint separate Trade Commissioners in other countries.

X. THE FINANCE OF AGRICULTURE

As in every other country, the cultivator in India needs, from time to time, some source of capital either for carrying out permanent improvements, for the purchase of more expensive implements or for current requirements. The greater proportion of the funds required for these purposes is provided by local moneylenders, who, however, make no distinction between capital required to finance an industry and the money needed for ordinary household expenditure. Government also give loans for agricultural purposes under the Land Improvement Loans Act, 1883, and the Agriculturists' Loans Act of 1884. It has, however, never been the policy of the State to impose restrictions on the financing of agricultural operations by private individuals. Such restrictions as have been imposed have all been devised to deal with agricultural indebtedness and to check the activities of the usurious moneylender.

Mortgage of agricultural land is the most common method of arranging long-term credit and the total sum advanced upon this form of security must now be very large. Mortgage credit is rarely used to finance improvements in agricultural land. It is resorted to when the unsecured debt becomes larger than the lender considers safe and, in times of distress, for ordinary agricultural needs. In some provinces, legislation has laid emphasis on automatic extinction in certain cases within a limited period. The evidence given before us inclines to the view, in which we agree, that no usufructuary mortgage of agricultural land should be permitted by law unless provision is made for automatic redemption within a fixed period of years of which twenty should be the maximum. The risk of collusive evasion must be recognised but education and the development of character are the only specifics against both the wiles of the lender and the recklessness of the borrower. Another point in connection with mortgages is the reluctance of the mortgagees to accept redemption. The Usurious Loans Act was amended in 1926 to enable a mortgagor to take advantage of its provisions when suing for redemption. The Punjab Alienation of Land Act of 1900 and the Punjab Redemption of Mortgages Act of 1913 give certain powers to deal with the question. The operation of the latter Act is restricted to mortgages, the principal sum secured under which does not exceed Rs. 1,000, or to mortgages of land not exceeding thirty acres. These restrictions might perhaps be removed. We commend to local governments the consideration of legislation on the lines of the Punjab Acts in regard to the redemption of mortgages.

Various enactments have from time to time been passed by different local governments to deal with transfer by sale or mortgage of agricultural land to non-agriculturists. The best known of these are the Punjab Land Alienation Act and the Bundelkhand Land Alienation Act. The Bombay Land Revenue Code lays down rules with a similar object. The desirability of extending the principle

of statutory restriction on the alienation of land to districts or provinces other than those in which it is now operative is one which, in our view, can only be measured in the light of local conditions including the state of mortgage debt amongst cultivators, the extent to which land is actually passing from agricultural to non-agricultural classes, and the feasibility of defining with reasonable precision those agricultural tribes or classes whose interests it is sought to protect.

The business of joint stock banks, so far as it relates to the advancing of loans on the security of agricultural land, is usually confined to the larger landholders, the planting community and others who possess tangible marketable security. Outside these narrow limits, its effect on agricultural operations is not appreciable. Schemes for wholesale redemption of debt by private banks with the help of government funds have been put forward from time to time. The history of the Agricultural Bank of Egypt is, however, an instructive warning to those who hold that problems of rural debt are to be solved by the provision of cheap and abundant credit. In fact, cheap credit is a blessing to a rural population only where the average cultivator is possessed of the knowledge and strength of character required to induce him, on the one hand, to limit his borrowing within the range of his capacity to repay, and, on the other, to apply the greater part of the borrowed money to sound productive purposes.

As a general rule, it may be said that the larger landlords do not take that interest in the development of their estates which might be expected. In some cases, tenure or tenancy laws are an obstacle. We would suggest that, where existing systems of tenure or tenancy laws operate in such a way as to deter landlords who are willing to do so from investing capital in the improvement of their land, the subject should receive careful consideration with a view to the enactment of such amendments as may be calculated to remove the difficulties. The establishment of "home farms" run on model lines is to be commended and, where tenure difficulties arise, action to permit of the establishment of such farms appears especially necessary.

The Land Improvement Loans Act has on the whole worked well, but it is doubtful if its provisions are as widely known as they should be. Complaints of delay in dealing with applications are numerous, but reflection will show that in most cases some delay is inevitable if the enquiries preliminary to the grant of a loan are to be carefully carried out. Greater elasticity in the rules would increase the temptation to unwise borrowing, while careful scrutiny of the security offered, supervision to ensure that the loan is actually expended on the improvement for which it is granted, and insistence on regular recoveries are all necessary in the interest of the borrower himself. When land mortgage banks are firmly established, part of the allotments under this Act might be placed at their disposal provided that steps are taken to ensure utilisation on objects which fall within the scope of the Act.

With the limitations referred to in the case of the Land Improvement Loans Act, the Agriculturists' Loans Act has also on the whole worked well. The grant of loans is restricted to the owners and occupiers of arable land and the purposes of the loans to the relief of distress, the purchase of seed or cattle and any other purpose not specified in the Land Improvement Loans Act but connected with agricultural objects. Since the Act came into force, it has proved of immense value in times of distress, whether arising from drought, floods, epidemics or earthquakes and is a potent weapon in the hands of any local government called upon to deal with a sudden emergency which requires the immediate issue of capital for current needs. The rules have repeatedly come under revision and are now as elastic as the interests of both borrower and lender permit. We are of opinion that this Act must remain on the Statute Book until the spread of thrift or of co-operative credit or of both renders it obsolete.

Knowledge of rural indebtedness and its causes has steadily increased as the subject has again and again come under review. The general expansion of the credit of the land holder, his illiteracy, and the temptation he has to relieve present necessities by mortgaging his future income and even his capital, have, on the one hand, led to increase in indebtedness, while, on the other the position of the moneylender has been strengthened by the rapid development of commerce and trade, the introduction of established law and permanent civil courts, and the enactment of such measures as the Contract Act. The annual reports on co-operation have contributed much information of value on the subject of indebtedness and village surveys in different provinces have thrown light on the details, whilst Mr. Darling's book on "The Punjab Peasant in Prosperity and Debt" is a valuable study of the subject. The conclusions drawn in this book apply to an area far beyond the confines of a single province.

Legislative measures designed to deal with the problem of indebtedness have proved a comparative failure. Evidence was received in one province that the provisions of the Civil Procedure Code exempting the cattle, implements and produce of agriculturists from sale may be ignored. The Kamiauti Agreements Act in Bihar and Orissa has been found ineffective. The provisions of the Deccan Agriculturists Relief Act are being evaded and the Usurious Loans Act is practically a dead letter in every province in India. We consider that an enquiry into the causes of the failure to utilise the last-named Act should be made in all provinces. If its provisions were fully utilised, this would go far to remove the worst evils of uncontrolled usury. Other Acts worthy of the consideration of local governments are the Punjab Moneylenders Bill and the British Moneylenders Act of 1927 while the case for a simple Rural Insolvency Act should also be examined.

We have no hesitation in recording our belief that the greatest hope for the salvation of the rural masses from their crushing burden

of debt rests in the growth and spread of a healthy and well-organised co-operative movement based upon the careful education and systematic training of the villagers themselves. Apart altogether from the question of debt, co-operative credit provides the only satisfactory means of financing agriculture on sound lines. Thrift must be encouraged by every legitimate means, for the savings resulting from the thrift of the cultivating classes form the best basis of the capital they require. If the rural community is to be contented, happy and prosperous, local governments must regard the co-operative movement as deserving all the encouragement which it lies within their powers to give.

XI. CO-OPERATION

No subject allied to agriculture is more frequently referred to in the course of our Report than co-operation. Like irrigation, it has been dealt with by a special Committee, that presided over by Sir Edward MacLagan, which reported in 1915. The report of that Committee contains an authoritative series of recommendations which have formed a guide for provincial policy in the direction of the movement. It dealt chiefly with credit societies which still form the main line of activity of the movement.

Historically, the co-operative movement may be said to have originated with the recommendations of the Indian Famine Commission of 1901. Prior to that date, an exhaustive study of the system had been made by Sir Frederick Nicholson on behalf of the Madras Government and his reports were published in 1895-97. A few societies, which at that time could only be registered under the ordinary company law, had been started in the United Provinces and the Punjab, but the movement only really began to function with the passing of the first Co-operative Societies Act of 1904. The operation of this Act was strictly limited to credit. It was passed, not as the outcome of a popular demand, but was essentially the act of a Government anxious to ameliorate the condition of the people, and, to give it effect, a government department had to be established. In 1912, a second Act was passed and is still in force throughout India (except in Bombay and Burma which have their own Acts). This permitted the extension of the movement to non-credit activities. But credit societies still hold the field as is natural where rural indebtedness is so general, and they have this further important advantage that a good credit society has an excellent educative value and is the best foundation for more ambitious schemes. The rural credit society is, in point of fact, the chief corner-stone of the whole movement.

The progress of the movement is indicated by the fact that, in 1926-27, there were in British India some 67,000 agricultural primary societies with over two and a quarter million members and with a total working capital of nearly 25 crores of rupees. The main results achieved may be said to be the provision of a large amount of capital at reasonable rate of interest, and the organisation of a system of rural credit which, carefully fostered, may relieve the cultivator from the burden of usury.

Success in co-operation cannot, however, be gauged by figures and our enquiries have shown that progress has not been uniform in all provinces, and that increase in numbers has not always been accompanied by improvement in quality. The reasons for this would appear to be that, while societies have been registered freely, there has been a lack of patient and persistent education of the members in the principles and meaning of co-operation by teachers competent to perform their task efficiently under adequate supervision. Further there is evidence

that supervision and guidance have been withdrawn too soon. Members of co-operative bodies have not been adequately trained to assume the responsibilities thrown upon them ; a natural restiveness under control has found expression in resentment against what has appeared to be undue official interference and transactions have been embarked upon which have led to disaster.

Within recent years, a large number of honorary workers have interested themselves in co-operation, and their contribution to the success of the movement has been great. But it stands to reason that these honorary workers, most of whom have other professional or private interests, cannot devote the amount of time necessary for detailed instruction or supervision of societies. To the failure to recognise the limitations inherent in the system of utilising honorary workers must be largely attributed the very serious defects in the movement which have been brought to our notice. We consider that there is full scope for both the honorary workers and the official staff, and the time has not yet come when the official staff can be eliminated or even reduced. We, therefore, strongly recommend that every effort should be made to build up a highly efficient and well trained official staff in all provinces. Their duty will be to educate the members up to the point at which they will be competent themselves to undertake the duties of the official staff and so to dispense with their services. It will be for them to strengthen the hands of the honorary workers by furnishing skilled advice and guidance in the more difficult problems and to supervise the work of unions and federations engaged in the management and control of the movement. They should also devise new schemes to facilitate the work of other departments, to prepare the ground for their special propaganda and to organise the people to receive and adopt expert advice.

As the official head of the movement, the personality of the Registrar is a matter of the greatest importance. The post requires such special qualifications that we would recommend that local governments should select the very best man available. Administrative experience and knowledge of the people and their economic conditions and ability to enlist the co-operation of honorary workers are essential qualifications. It is most important that the Registrar should not be constantly changed. We consider that the minimum period of tenure of this appointment should be not less than five years and the maximum not more than ten years. The promotion in the regular line of an officer appointed to the post of Registrar should not be affected and we consider that he should retain his appointment as Registrar with the emoluments of the position of a higher grade in the service if he has reached the stage of promotion. It is most important also that a Registrar should always have one or more officers under training to act for him when on leave and ultimately to succeed him. Every opportunity should be given to registrars and the officers of the department to study the co-operative movement in Europe or elsewhere.

With regard to the training of members of the government staff, the Punjab entrusts this duty to three educational inspectors who give

a course of intensive training in rural economics to approved candidates for the post of inspector in the Co-operative Department and hold classes for training sub-inspectors. In Bombay, auditors have to pass an examination in co-operative accountancy conducted by the Government Accountancy Diploma Board. We consider that the question of training the staff should be taken up seriously by all provinces and would recommend for consideration the procedure followed in the Punjab and in Bombay.

As regards the supervising agency, in some provinces supervision is largely undertaken by provincial unions which maintain a paid staff for whose education, training and efficiency they are responsible. The federation of primary societies into special unions who organise the work of supervision has been tried in some provinces with varying success. Provincial unions or institutes also undertake the work of propaganda and organisation and in other ways strengthen and stimulate the movement. Efforts in the direction of organising and developing such unions or institutes deserve every encouragement. Such unions or institutes may reasonably look to Government to supplement their resources with grants-in-aid. As a general principle, we do not think that central banks should undertake the work of supervision although there is no objection to deputing inspectors from provincial or central banks to examine the working of societies provided the duties of the inspectors are clearly defined and they are strictly confined to them.

In the early stages of the movement, Government advanced considerable sums of money as capital. This practice has now almost entirely ceased. We consider, however, that assistance from Government might be given in the following ways :—

(a) by contributing towards the out-of-pocket expenses of honorary workers both whilst under training and whilst they are working in the field ;

(b) in assisting institutions whose object is to spread education and the application of co-operative principles to various objects and assisting unions in supervision ;

(c) in promoting organisations on a co-operative basis to facilitate specialised forms of co-operative activity, such as the consolidation of holdings, adult education, irrigation and the like ;

(d) in the propagation of the movement in backward tracts.

As a rule, we consider that Government should spend money rather on education than audit. The audit of healthy societies is not a proper charge on the public funds.

Various concessions are given by provincial governments to co-operative societies such as exemption from income tax, from stamp duty and from registration fees and the provision of facilities for the transfer of funds at par by means of remittance transfer receipts. These are detailed in the main Report and we recommend that, where possible, all the concessions indicated should be granted by provincial

governments to societies within their area. In particular, co-operative societies should be allowed to take full advantage of the facilities afforded by the district treasuries and subtreasuries for the movement of money to finance agriculture. They should be given a refund of three-fourths of the commission on postal money orders, when these are employed for remittances between societies, and should have a "first charge" on the property of their members where this has been purchased by a loan from a society or consists of a crop grown from seed obtained by such a loan.

The question of land mortgage banks has come into prominence within recent years. It has become apparent that village credit societies are not suitable agencies for the grant of long-term loans and that this class of business should not be mixed up with the short-term credit which it is the function of the village society to provide. The Conference of Registrars held at Bombay in January, 1926, considered the question and decided that land mortgage banks could, and should, be established under the provisions of the existing Co-operative Acts. We endorse the resolution passed on the subject at the Conference. The Acts already provide for land mortgage credit and we consider that, for the present, they should be utilised for the formation of land mortgage banks, and that no special legislation is required to establish such banks. With regard to assistance by Government to land mortgage banks, we do not recommend that Government should subscribe to debentures but we consider that a guarantee of interest on the debentures would be a suitable form of assistance. We consider also that the issue of debentures of land mortgage banks should be controlled by a central organisation, otherwise the position will arise of a number of small institutions flooding the market with competing issues. Land mortgage banks would be a suitable agency for distribution of loans under the Land Improvement Loans Act, and their debentures should be added to the list of trustee securities. We would emphasise the importance of a most careful preliminary enquiry before a land mortgage bank is floated and would insist on efficient management as essential. The simpler the constitution of such banks, the better they are likely to function.

So far little progress has been made with non-credit societies as compared with credit societies. This is natural as advance in other directions is difficult until the burden of rural debt has been definitely lifted from the shoulders of the cultivator. Purchase and sale societies, seed societies, cattle insurance societies and other forms of non-credit activity have been attempted with varying success, but it cannot be claimed that any substantial advance has generally been made in any of these directions. If such societies are to be successful, business management is required and it is not easy to find the capacity for this amongst their members. As a matter of principle, the single purpose society seems the best line of development. "One thing at a time" should be the policy.

Throughout our Report, we refer to the importance of co-operative societies in connection with other activities and, in particular, in their relation to agricultural improvement, to education, to irrigation and in fact to anything which affects the cultivator. The function of the Co-operative Department, apart from the provision of credit, is to prepare the ground for the advice of the various experts employed by Government in its several departments. Naturally these departments can work best through co-operatively organised bodies of cultivators rather than through isolated individuals. The co-operative society should be the unit through which the various departments of Government concerned with rural welfare carry on their activities. As examples of the successful organisation of non-credit societies may be mentioned the Better Farming societies in the Punjab, the sale societies in Bombay and the Punjab, and the irrigation societies in Bengal. The desirability of appointing a special officer of the grade of deputy director of agriculture to work under the Registrar deserves to be examined in all provinces. As regards the appointment of specialist officers from other technical departments, much will depend on the stage of development and the particular form of co-operative activity which it is desired to foster.

XII. THE VILLAGE

Economic changes are occurring rapidly in India. The development of communications and the consequent quickening and cheapening of travelling facilities are bringing the villages into closer touch with urban centres. This tends to break down the isolation and self-sufficing economy of the village. Contact with the towns introduces new ideas and a desire for better conditions of living.

CHAPTER XIV OF
THE MAIN REPORT.

The close relations between agriculture and public health are obvious and they react upon each other to a remarkable degree. There is no direction in which the rural community needs help more than in the provision of medical facilities and public health amenities. Economic wastage due to disease cannot be over-exaggerated. Malaria slays its thousands and lowers the economic efficiency of hundreds of thousands; plague and cholera sweep the country from time to time; hookworm disease, kala-azar and diseases arising from diet deficiency insidiously reduce the labour power of the cultivating classes. Any enquiry, therefore, into the general condition of agriculture and the position of the cultivator must take account of the public health aspect of his life; of the suitability of his diet; of the sanitary conditions under which he lives and of his general rural environment. In order that, as a result of the "better farming" to which we hope our proposals will lead, the cultivator may have that "better living" which should follow from it, it is necessary to take stock of existing conditions and consider what steps are necessary to improve them. These conditions in the rural areas are certainly bad. Sanitation, in any accepted sense of the word, is practically non-existent. The public latrine is too often the river bank or the margin of a tank. This predisposes to hookworm infestation and to the spread of all diseases incidental to a polluted water supply. The use of the open field, though not in all cases so objectionable, requires that the catchment areas of tanks and streams should be protected from pollution. Unprotected wells and tanks; unswept village streets; close pent windows excluding all ventilation—in such conditions does the average villager live—and yet observes a remarkably high standard of personal cleanliness and tidiness. The tragedy is that such a state of affairs should exist when, with corporate action on the part of the villagers, the evils would be so easily remediable. A common determination to protect wells, to keep villages clean and to avoid as far as possible the pollution of rivers would undoubtedly lead to an enormous improvement of the public health.

To deal successfully with this state of affairs imposes duties both on Government and on the people. It is the duty of Government to investigate basic medical problems and to enunciate and direct sound principles of public health administration. It is the duty of the people to co-operate in giving effect to such recommendations, and generally to assist in improving rural conditions. Much is being done by government and private agency and the general economic trend of events is conducive to, and suggests the possibility of, a rapid improvement in rural

conditions at no distant date. The matter largely rests with the people themselves.

Government discharges its duties through its public health and medical departments. The concern of the provincial public health departments is the establishment throughout each province of such precautionary conditions as render the incidence or spread of disease less likely. In recent years, there has been a great forward movement in this direction and questions of improved water supply and sanitary and conservancy arrangements have received an increasing amount of attention. The most highly developed provincial department is that of Madras which has a district health scheme with 26 health officers and 261 health inspectors.

On the medical side, the greater part of the research undertaken by the central Government is carried out by officers working under the Indian Research Fund Association. The objects of this Association are the promotion and assistance of research, the propagation of knowledge and experimental measures generally in connection with the causation, mode of spread and prevention of diseases, primarily of a communicable nature. Much research work has been done under the auspices of this Association in connection with such diseases as cholera, plague, malaria, kala-azar and in the investigation of problems of diet deficiency.

In the Bombay presidency, a village medical aid scheme has been devised under which rural schoolmasters are trained to deal with minor ailments and to administer first aid. In some provinces, schemes have been adopted under which private practitioners are given subsidies to induce them to settle in rural areas. Various schemes have also been evolved for the training of village midwives and nurses. Schemes of this nature have great potentialities and should be given all possible encouragement. Some local governments are already making annual grants to local authorities for the improvement of the potable water supplies. We consider such improvement a matter of paramount importance and in view of the heavy cost of water borne epidemics, we suggest that all governments may well regard expenditure on this object as constituting a sound policy of insurance.

In the course of our tour, we have been much impressed by the great awakening of non-official interest in the health and welfare of the country-side. It is from this manifestation of public interest that we derive our greatest encouragement and hope. This awakening is general and not confined to any particular province. As typical examples of such efforts, we would mention the Poona Seva Sadan Society, the Co-operative Anti-Malaria Society in Bengal, and the rural reconstruction work of the Y. M. C. A. in southern India.

Of all the diseases of India, malaria is the most widespread and its effects on the efficiency of the rural community are disastrous. The principal prophylactic in the treatment of this disease is quinine and cinchona febrifuges and not the least of Government's responsibilities in the control of malaria is connected with its policy in regard to the manufacture of this

drug. At present, all the cinchona plantations with one exception and the factories for the manufacture of quinine are owned by the provincial governments of Bengal and Madras. If the question of malaria is to be seriously tackled, we are strongly of opinion that the development of cinchona cultivation in all provinces which contain areas suitable for its growth, the manufacture of quinine and the control of its distribution, so far as price within India is concerned, should be taken over by the Government of India. In view of the all-India importance of the question it is not one which should be left to local governments, however efficiently they may in the past have carried out their obligations in the matter. In view of the great importance of extending cinchona cultivation and cheapening quinine, we consider that much more scientific investigation is called for than has been undertaken in the past.

In concluding our remarks on public health we desire to emphasise the urgency of the need for developing the rural medical and public health services to the utmost possible extent and with the utmost speed.

The problems of human nutrition, which have only recently come into prominence are being investigated by Colonel McCarrison who is working under the Research Fund Association at Coonoor. He lays emphasis on malnutrition as a problem facing those engaged in agricultural research. In his enquiries, Colonel McCarrison invokes the aid of the agricultural departments. The problems of human and animal nutrition are likely to assume such importance that we consider it desirable that work on human nutrition and on the nutrition of farm animals should be carried out in the closest co-operation, or, in other words, that there should be team work by workers with a knowledge of different branches of the science of nutrition. Continuity is also essential. The various workers on nutrition problems should be formed into a Committee on Nutrition which would meet at regular intervals to discuss common questions. This would assure the requisite close touch between workers in different branches of the subject. In view of the importance of the subject, we recommend that a Central Institute of Human Nutrition should be established. Although it is not necessary that both branches of nutrition work—human and animal—should be carried out in the same building, it is desirable, in order to secure the closest possible connection between the research workers in both these branches, that the respective institutes should, if possible, be at no great distance from each other.

In connection with diet, we are much impressed by the possibilities of a development of the fish industry in India and would commend this matter to the attention of local governments.

So far we have dealt mainly with what may be called the health aspects of the cultivator's life. We now propose to consider what help can be given to the villagers to enable them both to adjust themselves to changing conditions and to reap the fullest advantages from the various technical services with which they are now coming increasingly into contact.

Throughout our investigation, we have constantly been impressed with the thought that mere material improvement alone will not bring

lasting benefit to the agricultural population. Increase in yield by better seed and better cultivation; security of the harvests gained by the expansion of irrigation; immunity from losses due to pests or pestilence; higher prices from improved communications and conditions of marketing; everything, in short, which we have advocated for the material advancement of the people will merely postpone the effects of the growing pressure of the population on the soil. No lasting improvement in the standard of living of the great mass of the population can possibly be attained if every enhancement in the purchasing power of the cultivator is to be followed by a proportionate increase in the population.

In this Report, we have in their proper places stressed the importance of primary education, adult education and that more special form, the education in the economics of daily life, provided in some provinces through the agency of the co-operative staffs. We must now turn to other means calculated to stimulate the desire for better living. We are strongly of opinion that guidance here is far more called for than anything in the nature of what, for want of a better term, we shall call charitable assistance. What is required is to increase in desirable directions the number of the villager's wants and to show him how to satisfy them by his own efforts. We trust that the whole weight of those to whom the villager looks for guidance will be thrown into suggestions how to improve, during his spare time, the amenities of the village. Fortunately there is a tradition of corporate action for mutual benefit to which to appeal. In the olden days, tanks were dug or cleaned out, wells sunk and roads made or repaired in this way. Although this good custom has largely fallen into disrepute, we think that, if its advantages were brought home to the villager, a voluntary revival of it for these and other purposes such as the provision of a good supply of drinking water, drainage and street improvement should be possible. If revival is not possible, hope of radically improving the amenities of the village must be abandoned. The cultivator himself is not well enough off to pay for hired labour and it is certain that neither the local bodies nor the provincial governments can provide either the men or the finance for carrying out such undertakings.

It cannot, however, be reasonably expected of the cultivator that he should, unaided, revive this ancient custom of corporate action and utilise it for the improvement of the village and its surroundings. He lacks leadership, and the difficulty is to suggest the leader. The educated man is not willing to live his life in a village except in a few cases where ideals of social service overcome the absence of amenities. The system of village guides devised by Mr. Brayne, I.C.S., in the Gurgaon district of the Punjab seems worthy of consideration. Young men are given a special course of training which, in addition to imbuing them with a sense of the dignity of corporate labour for the mutual benefit, is designed to familiarise them with the principles of sanitation, elementary medical aid, co-operation, and agricultural improvement, and to give them some knowledge of the simpler home industries in order that each man may, when his training is completed, act as

"guide, philosopher and friend" to the group of villages to which he is posted. In technical matters, his knowledge is meant to enable him to direct the villagers where to go for advice rather than to give that advice himself. This system of village guides is part of an organisation in the Gurgaon district which has as its aim the general uplift of the rural community. The scheme embraces the work of every department of Government engaged in rural areas; it seeks to assist in securing the adoption of the advice of the expert by a well-planned propaganda campaign; it depends for its success on the enlistment in the cause of every one willing and able to assist, official or non-official, and more especially of the people themselves whose welfare is in the balance. Lecture, song, drama, magic lantern, cinema, and even the loud speaker are made to contribute what they can to arouse the people to a realisation that they themselves are largely responsible for their own undesirable condition. The attention of the villagers is thus attracted. Side by side with the propaganda campaign, there are provided facilities for those who wish to try the advice so tendered. Good seed, selected bulls, ploughs, well-gear, quinine, inoculation, and so on, are readily available. Co-operative societies, adult schools, domestic economy classes and every other means calculated to assist the spirit of service and self-help are at hand. Everything useful is brought within easy reach of those who need it. The chief value of this scheme, in our eyes, is its illustration of the great benefit which accrues from an all round effort at village improvement by everyone interested.

Next to making some one individual resident in the village itself responsible for advising the villagers, where to go for advice and how best to utilise their own skill and resources in improving the amenities of the village in their spare time, we attach most importance to linking the villages with the social life of the town. We consider that this can best be effected by social workers organised in societies like the Seva Sadan Society of Poona. Such organisation facilitates continuity of policy and steady pressure over a long period, both of which are required if permanent results are to be obtained. The universities also have an obligation and a great opportunity to assist in the work of rural development both on the economic and educational side. In particular, they might institute and organise economic surveys. In the Punjab, there is a Board of Economic Enquiry which is a non-official body consisting of officials and non-officials interested in economic studies. The establishment of such a Board in other provinces would give university students of economics ample opportunities for socio-economic enquiries under capable direction.

We would also refer to the Punjab Central Rural Community Board. The personnel of this Board is largely official but it is linked with a rural community council, set up in each district of the province and predominantly non-official. Each council is assisted in its work by the attendance of representatives of the various departments concerned with rural development, namely, educational, agricultural, veterinary and co-operative officers. The intention is that each district

community council should co-ordinate the propaganda work of all these development departments.

Sufficient experience has not been gained to pass an opinion on the practical efficiency of these councils. We are not, therefore, in a position to say to what extent this organisation may be suited to the needs of other provinces. The scheme certainly combines the advantages of both the official and the private type of organisation. This experiment deserves, therefore, the close attention and consideration of workers in other provinces. In our opinion, the movement will gain in power for good if it develops a women's side to its activities. The establishment of a women's institute in a village would supply a centre for educational and co-operative activities as well as for mother and infant welfare work and might remove the present obstacles to the employment of women teachers in village schools.

Local public opinion in favour of particular measures can also be organised by the formation of co-operative Better Living societies. The possibility of facilitating the settlement of village disputes by local arbitration organised on a co-operative basis also calls for careful consideration. There is a general awakening of public interest in the depressed classes. The most efficient means of effecting any improvement in their condition lies, in our opinion, in education and the consequent inculcation of self-respect and self-help. In no field of rural work have private organisations a greater opportunity for usefulness.

XIII. EDUCATION

No enquiry into the rural economy of India with a view to the promotion of the welfare and prosperity of the rural classes would be complete without a careful survey of the existing systems of education, their suitability to village conditions and their influence.

Education is a transferred subject. For administrative purposes, educational institutions are divided into two classes, those recognised by the departments of education and those which are not so recognised and are, therefore, not inspected by government agency. Over British India as a whole, institutions that are recognised are six times as numerous as those unrecognised. Sixty-five per cent of these recognised institutions are privately managed, though subject to government inspection, and, of the remainder, thirty-three per cent are managed by district boards and municipal councils and two per cent are under direct government management. The importance of those under government management is out of all proportion to their number. It is unnecessary here to describe the legislation which governs the educational functions of local bodies in the different provinces. It will suffice to say that the most important additions to this legislation in recent years have been Primary Education Acts, one of the main objects of which has been to empower local bodies to introduce compulsory primary education in selected areas.

So far as the general mass of the agricultural population is concerned, primary education and the attainment of literacy are the main considerations. In this connection, the following statistics are of interest. In 1921-22,* the percentage of scholars in the primary stage, in both recognised and unrecognised institutions, to the total population of school-going age (*viz.*, 15 per cent of the total population) for the whole of British India was 32.2 males and 7.6 females. The percentage distribution of scholars, in 1925-26, in recognised institutions (no figures are available for non-recognised schools) was for males 87.1 in the primary stage, 8.8 in the secondary, 3.2 in special schools† and 0.9 per cent in the universities. For females, the corresponding figures were 95.2, 3.6, 1.1 and 0.1 per cent. At the census of 1921, the percentages of literacy for persons 20 years of age and over were 18.3 for males and 1.9 for females. The percentages for males ranged from 62 per cent in Burma to 8.9 in the United Provinces and for females from 11.8 per cent in Burma to 0.7 per cent in the United Provinces and Bihar and Orissa.

While the proportion of children of school-going age attending primary schools is still disappointingly small, it is increasing with some rapidity. A large proportion of those who attend these schools do not, however, remain at them long enough to ensure their reaching the

* Statistics are not available which could enable this information to be given for a later year.

† Special schools consist of technical and industrial schools, normal and training schools, commercial, medical and reformatory schools, schools for adults, schools for defectives, etc.

minimum standard of literacy and no definite information is available as to the extent to which those who reach this standard relapse into illiteracy. For this failure to achieve more rapid progress in primary education various reasons are given and we suggest directions in which improvements are possible.

Our enquiries have left us firmly convinced of the great importance to rural development in India of the spread of literacy amongst women. There are indications of an awakening interest in this direction. But progress is slow and we would suggest the desirability of demonstrating in striking fashion the value to the community of the education of its women, particularly in its effect upon the spread of lasting literacy amongst the young. Steps to this end might be taken fully by recording the educational history and subsequent development of children of typical cultivating families in which the mother is literate, while like particulars of illiterate homes in the same neighbourhood and conditions of life should be tabulated for the purpose of comparison with their more fortunate neighbours. It is essential, however, that the families chosen should be of entirely rural condition and not urban. Where no literate homes of the cultivating classes are available, we think a definite effort should be made to impart literacy to a certain number of young mothers selected where conditions are most suitable and where no similar experiment has been tried before. We have little doubt that the result of this comparison will show a markedly stronger tendency on the part of the literate parent both to send the children to school and to keep them there till literacy, which the mother has come to value, has been fairly achieved.

We think that the trouble and expense involved in the collection of the necessary facts will be simply repaid if, as we anticipate, the result is to provide convincing propaganda which can be used to demonstrate in ways that all will understand the true relation between female literacy and the spread of general literacy.

We consider that, if teaching is to be efficient, the training of the teacher must be improved and there must be an increase in the number of trained teachers. If possible, female teachers should be provided for small children for it is the experience of all countries that they are best qualified for such work. Although we realise that financial consideration may militate against the provision of a second teacher for the small primary school, we consider that a minimum staff of two teachers should be the ideal to be aimed at. Teachers in primary schools should be drawn wherever possible from amongst those who are familiar with rural life and the text-books should deal with every day objects familiar to the pupil and have a rural tone. The faculty of observation should also be developed by occasional school walks through neighbouring cultivation. If the teacher happens to be a keen and well-informed gardener or has qualifications for teaching nature study on sound lines, he should be encouraged to impart his knowledge to such of his pupils as are willing to learn. A stimulus in this direction might be given to the teacher by a supplement to his pay. But a pretence of teaching agricultural methods to boys five to ten years old, whether theoretically

in the guise of nature study or practically in school gardens, should be avoided.

We are convinced that the progressive adoption of the compulsory system is the only means by which may be overcome the unwillingness of parents to send their children to school and to keep them there till literacy is attained. The provision of a sufficiency of trained teachers and of suitably equipped buildings must, of course, precede the enforcement of compulsory school attendance. Finance also imposes a limitation. Uniform progress cannot therefore be expected. But in all provinces (except Bengal where a Primary Education Bill is under consideration) legislative sanction exists for the introduction, at the discretion of local authorities, of compulsory education in rural areas. In all the provincial legislation on the subject, the onus of proposing the establishment of a compulsory area is placed on the local body concerned with primary education. The first essential for the spread of primary education is, therefore, to bring public opinion to realise that efficiency can only be secured by the introduction of the compulsory system. In the Punjab, the only province in which any measure of success in introducing the compulsory system can be said to have been achieved, the co-operative movement has been brought to bear on this problem. One hundred and fifty-eight societies with a membership of 7,000 parents pledge themselves under penalties to keep their children at school for four years continuously or until the completion of the fourth standard.

Within recent years, the question of adult education has assumed some prominence, notably in the Punjab and Bengal and to a lesser extent in Bombay. In the Punjab, the movement has in the main received its stimulus from the Co-operative Department. It is to co-operative societies and associations of public spirited individuals, interested in rural development, rather than to direct government agency that we must look for any marked advance in this direction. We consider, however, that there may be a case for Government assisting co-operative societies by a *pro rata* contribution from provincial revenues to the funds which a society has been able to raise privately.

Immediately above the primary school comes the secondary school—vernacular middle and Anglo-vernacular schools. The boys attending these schools are ordinarily from ten to fourteen years of age. The next stage is the high school—the stepping stone to the intermediate colleges and universities. Boys attending these are from thirteen to seventeen years of age. In 1925-26, there were 9,867 middle and high schools with 1,583,000 pupils. According to the last estimate made (1922), some half-a-million boys who are attending primary classes attached to secondary schools have, however, to be deducted from this number in order to arrive at the correct number of boys undergoing secondary education. Our concern with secondary education is the extent to which, and the manner in which, agricultural education can best be given in secondary schools. This subject has been much discussed. The divergencies of opinion in regard to it have led to the evolution of two

entirely different types of school; the vocational school and the ordinary rural secondary school, in the curriculum of which elementary agriculture is included. The former type finds favour in Bombay. In the adoption of the other, the Punjab has led the way.

At the Marathi Agricultural School at Loni near Poona, which is of the vocational type, admission is limited to fifty boys and the qualifications laid down for it are that the applicant must belong either to a cultivating or a landholding class, that he must have completed his education up to the fourth Marathi standard, that he must be between fourteen and seventeen years of age and that his object in coming to the school must be to train himself for work on his own land and not for service in a government department. The course lasts for two years and the instruction which is given in the vernacular is both theoretical and practical. Three hours daily are devoted to practical work on the farm of twenty-two acres which is attached to the school and the whole area of which is worked by the boys. In his second year, each boy is made responsible for the cultivation and cropping of an area of about one quarter of an acre; he is also required to keep a diary of his daily work and a cultivation sheet of expenses and realisations. Two crops are raised during the year, one dry and one irrigated. The care of the milking herd and of the farm bullocks is entrusted to the boys. The school has a workshop in which they learn smithy and carpentry work and also an oil engine and power driven farm machinery which they manage. Weekly visits are paid to neighbouring cultivation and, during their second year, the boys are taken on an extensive tour throughout the presidency. It is important to note that, if the student remains at the school for the whole of the course, this education is provided free of all cost except the small amount which has to be deposited to meet current expenses. There are now six schools of this type in the Bombay Presidency but it has so far made little headway in other provinces.

In the Punjab type, elementary agriculture is an optional subject in the curriculum of the ordinary vernacular middle schools. In the words of a Circular which was issued in 1923: "the aim is to enrich the middle school course in rural areas by the inclusion of agricultural training and thus to bring it more in keeping with the environment of the pupils; and the object is to use agriculture as a means of mental discipline and training and as an important accessory to the general subjects taught in these schools."

Under this system, the instruction given in the class room is both illustrated and supplemented by practical work in all agricultural processes on the land. For this purpose, farms of about three acres in extent were attached to the schools in which the new course was first introduced but, owing to financial stringency, the alternative of school gardens, half an acre to an acre in extent, was adopted in 1923. Six periods per week are devoted to the course by each of the four classes which make up the vernacular middle school in the Punjab. All the work on the farms and gardens, except that of looking after the bullocks on the farms, is done by the boys themselves, and it is interesting to note that many of the farms

and gardens are not only self-supporting but have an annual balance to their credit. The teaching is in the hands of trained and carefully selected teachers who have first taken the ordinary senior vernacular training course and have then completed a separate course in agriculture at the Lyallpur Agricultural College. An additional link between the agricultural and educational departments is provided by the fact that the general supervision of these activities is entrusted to an adviser in agricultural training who is an officer of the Education Department. His headquarters are at the Lyallpur Agricultural College. When we visited the Punjab, there were 66 schools of this type, 26 of which had farms attached to them and 40 gardens. It was hoped to increase the number during 1927-28 to 121, of which 64 would have farms and the others gardens. The Punjab model has been very closely followed in the United Provinces, where there are, or shortly will be, some twenty of these schools. In Bombay, there are forty-three schools known as 'agricultural bias' schools of a very similar type.

After the most careful consideration, we have come to the conclusion that in no scheme of rural education the cost of which is defrayed by Government ought schools of the Bombay type to find a place. There is no evidence that there is a popular demand for them. They appear to us to be an artificial addition to the educational system and in no way a natural development of it. They are very costly and lead nowhere. The boys who attend them receive no instruction in the subjects required by high school and college. It is only in exceptional circumstances that a parent is prepared to decide upon the future career of a promising boy at the early age of thirteen or fourteen. The establishment of schools of the Bombay type merely means that an agency far more expensive than the normal is employed to train boys destined for work on the land.

We consider, on the other hand, that the Punjab type of school has much to recommend it. It is true that this method of imparting instruction in elementary agriculture in rural middle schools has not been in use sufficiently long to enable conclusions as to its merits to be reached. It may be, as we were told in Bombay, that most of the boys who pass through the course will prefer to become teachers or village accountants to farming their own land. But even if this should prove to be so, the value of the training in agriculture they have received will not be lost to the country-side and there would still remain a large residuum who would take up agriculture as their occupation. In the meantime, there is no doubt that the classes have so far proved a great success and that they have attained a popularity which has been denied to schools of the vocational type. Although no approximation to a final solution has been attained, it is, in our view, in this direction that the true solution of the problem of relating the instruction given in middle schools in rural areas to their environment is to be found. Similarly with regard to agricultural teaching in high schools. Where these schools contain a large proportion of boys from rural areas and have facilities for the provision of a farm or garden, the addition to the curriculum of a combined course

of practical and theoretical instruction in elementary agriculture somewhat on the lines of that now given in the middle schools of the Punjab type but of a rather more advanced character would, we believe, be productive of good results.

In our observations on rural industries, we emphasise the importance of introducing modern processes. This introduction will be greatly facilitated if the various technical institutes provide instruction in applied science of a high standard.

We are concerned with the universities only as regards the relation of agricultural colleges to them and with reference to their influence on rural development. We approve of the policy of affiliating an agricultural college to a university wherever this is possible. We contemplate closer relations between the universities and the agricultural colleges in the future and, though affiliation for the purpose of obtaining a degree is not essential to such relations, it undoubtedly tends to promote them.

From the point of view of agricultural development, we need not emphasise the importance of the part that the universities must play in educating those who will become the administrators, the technologists, and the research workers of the future. Here, however, we are concerned with the urgent need of instilling in rural communities the ideals of leadership and service, and we wish to make plain our conviction that the universities have it in their power to make a valuable contribution to this end. It is their highest mission to develop in the student that public spirit and zeal for the welfare of his fellows which, when he goes out into the world, will impel him to take a full and active part in the life of the community in which his lot is cast. But universities are commonly situated in large centres of population, and members who are attracted by the call of social service naturally tend to apply themselves first to the problems of the town. We wish strongly to press the claim of the rural areas upon the time and interest of the best of India's youth. It is upon the homes and fields of her cultivators that the strength of the country and the foundations of her prosperity must ultimately rest. We appeal to both past and present members of Indian universities to apply themselves to the social and economic problems of the countryside, and so to fit themselves to take the lead in the movement for the uplift of the rural classes. We trust that the authorities and teachers of universities will do all in their power to encourage the study of those most important subjects. The opportunities open in India to men able and willing to play a selfless and patriotic rôle in the field of local leadership and of service to the public are unbounded. Membership of village *panchayats*, local boards and the like and work in connection with the co-operative and adult education movements as well as that carried out by non-official bodies concerned with the well-being and advancement of the rural population offer scope for the exercise of a wide range of talent and inclination. Such service is of the utmost value to the State, for the welfare and happiness of the peasant must be largely dependent on the purity and efficiency with which local services are administered.

Among a people whose history goes back as far as does that of India, and in a society upon which the fetters of custom are so firmly bound, the inertia of centuries can only be overcome by the ready self-sacrifice, by the enthusiasm and by the sustained efforts of those who themselves enjoy the blessings of a liberal education.

Higher agricultural education is provided at agricultural colleges established at Poona, Coimbatore, Lyallpur, Nagpur, Cawnpore and Mandalay. The first four are affiliated to a university. Bengal, Bihar and Orissa and Assam have no college. We recommend that agricultural colleges on the model of the existing colleges should be established at Dacca for Bengal and also in Bihar and Orissa.

In general, the object of these colleges is to train students for employment in the agricultural and other departments or to qualify them to manage their own land or that of others. Up to the present the great majority of the qualified students have been absorbed in the agricultural departments.

We regard the agricultural colleges as the apex of the whole scheme of agricultural education. They should make their influence felt in all branches of rural education and every student who enters them should be encouraged to realise that, given the capacity and application, his foot is set on the road which leads to post-graduate training and thereafter to the highest distinctions in the fields of science and agriculture.

In order to obtain students better qualified to profit by training at the agricultural colleges, we recommend that the intermediate science examination of the provincial university should be prescribed as the qualification for admission. This will relieve the colleges of the necessity for arranging courses in elementary science with the principles of which students should be familiar before they enter them. If the intermediate examination in science is made the standard of admission, a three years' course at an agricultural college will be adequate.

The curricula of the agricultural colleges have been drawn up on much the same general lines and appear to us to be suitable. We consider, however, that more attention should be devoted to agricultural economics, and that teachers of the subject should be selected with great care. More attention should also be paid to estate management, but to give instruction in this as part of the three years' course would involve the risk of overloading the curriculum and we, therefore, consider that directors of agriculture should make the best arrangements they can to provide passed students with opportunities of gaining experience in estate management. Such experience will be particularly useful for students who propose to farm their own land or that of others. Greater attention should also be given to agricultural economics and estate management in the two years' courses which are given in some of the colleges.

We also attach the greatest importance to miscellaneous short courses given at colleges. Colleges should initiate such courses and accept responsibility for creating a demand for them.

To remove the reproach that graduates of agricultural colleges are frequently weak on the practical side, something more than additional instruction in agricultural economics and estate management is required. Facilities should be provided to enable passed students to obtain further practical experience before commencing active work either in the public service or on their own lands.

As regards the college staff, we lay great importance on the personality of the principal. The head of an institution which combines research and teaching requires special qualifications, among which administrative capacity and breadth of outlook are as important as high scientific attainments. The best man available should be selected for this post and once appointed he should be retained in it and compensated, if need be, for foregoing appointment to the Directorship of Agriculture. All agricultural colleges should have a whole-time principal. The teaching staff of the colleges should also be carefully selected. Interchange between the administrative and the research and teaching branches of the agricultural services should ordinarily be restricted in the earlier years of service. The field of selection for the college staff might be widened to admit of the appointment of distinguished science graduates of Indian universities. We have carefully considered the question whether the research activities of the agricultural colleges should be entirely divorced from the teaching work and, as a result, we entirely approve the system under which the heads of sections give instruction in their special subjects. There can be no doubt, in our view, that such a combination of research with teaching is of mutual benefit to both.

For recruitment to the superior provincial services, post-graduate training, after taking a degree at an agricultural college, should be prescribed as an essential qualification. This can ordinarily be best given at Pusa. For the purpose of those graduates of an agricultural college who elect for other branches of government service, we recommend that a degree or diploma in agriculture should be placed on the same level as a degree in arts or science as a qualification for appointments in such departments as the revenue, irrigation and co-operative departments.

XIV. RURAL INDUSTRIES AND LABOUR

A problem of some importance is how the villager can best use his spare time for the improvement of his position.

CHAPTER XVI OF THE MAIN REPORT. The amount of spare time which the cultivator has on his hands varies greatly according to the local agricultural conditions but it may be assumed, as a broad generalisation, that a large majority of cultivators have at least from two to four months absolute leisure during the year. At the census of 1921, only 10½ per cent of the total working population in British India was shown as employed in industry of one kind or another, including factories. Apart from the large industries concentrated in industrial centres, the smaller concerns such as rice mills, oil mills, cotton ginneries, etc., engaged only some 250,000 people which is equal to about 0·03 per cent of the total number employed in agriculture. It will thus be seen that industries located in rural areas are at present unimportant from the point of view of their demand for labour. On the other hand, their multiplication within economic limits suggests one solution of the problem of spare-time employment in rural areas.

We have received various suggestions for the establishment of new industries which may offer increased employment to the rural population. An industry which seems to offer considerable promise is the extension of the local manufacture of agricultural implements. The engineering section of the agricultural departments can give valuable help in promoting such a development. Students who desire to be trained in implement manufacture should be encouraged by stipends to enable them to attend engineering schools, railway workshops or the workshops of the agricultural departments. Similar facilities should be provided for the training of the more progressive village artisans, such as blacksmiths and carpenters, who want to keep abreast of developments in agricultural machinery. Amongst other industries brought to our notice were paper manufacture from bamboo pulp, the oil-crushing industry and the handloom, pottery and rope-making industries, sericulture and lac. As regards sericulture, we would remark that there is a danger that the natural silk industry may be seriously affected by the increasing use of artificial silk, although at present high grade Indian silk meets the demand of the special luxury market. The lac industry appears to require organisation so as to bring together all the interests affected, while further research is needed to ensure a regular output of good quality lac. An enquiry should also be made into the economics of lac production.

There are opportunities for the development of a poultry industry and we are glad to note that increased attention is being devoted by the agricultural departments in most provinces to poultry rearing and the work done, notably in the United Provinces, suggests that this industry has possibilities of expansion.

With regard to rural industries in general, it may be said that the chief needs are the stimulus of new ideas and the provision of adequate

instruction and advice on the commercial side. The opportunities which they present for improving the condition of the rural population are extremely limited, and as a general principle it may be laid down that the chief solution of the problems of the cultivator lies in promoting the intensity and diversity of his agriculture.

The development of village industries on a co-operative basis is essential if they are to survive increasing competition. The question of organising them on such a basis should receive the attention of the departments of co-operation and industries in all provinces. One direction in which help could be given by Government would be by advances in special cases to artisan co-operative societies for the purchase of improved machinery. As small local factories dealing with the produce of limited areas multiply, the co-operative movement can play an important part in linking up the cultivator and the cultivator's produce with these localised factories. The main lines on which assistance can be given to the smaller industries to enable them to hold their own in the intensive competition of modern times are co-operative organisation and the provision of facilities for technical education. For a long time to come, Government will have to be prepared to make suggestions for the development of these industries and to assist them by advice. In some instances, they may have to make themselves responsible for running a pioneer enterprise.

Government can do much to assist the mutual adjustment between the larger industries and agriculture by their policy in respect to communications and the development of power, by technical education, and by the collection of marketing information.

Departments of industries have been constituted in Madras, Bombay, Bengal, Bihar and Orissa, the Punjab and the United Provinces and amongst their functions is that of the supervision of rural industries. Madras and Bihar and Orissa have passed State Aid to Industries Acts and the Punjab an Industrial Loans Act. Under these Acts, assistance, subject to certain conditions, can be given from provincial revenues to private enterprise for starting new industries. The intention of these Acts is to help the development of industries generally. Other things being equal we hope that particular attention will be paid to the development of agricultural industries. In some provinces, technical institutes exist for the training of artisans and it is on this education, general or particular, that we lay the greatest emphasis.

It is essential for the success of the departments of industries that the Director should be an experienced administrator.

The Famine Commission of 1880 observed that "the numbers who have no other employment than agriculture are greatly in excess of what is really required for the thorough cultivation of the land." The labour problem of to-day is the same from the agricultural point of view as it was when the Famine Commission wrote these words, namely, to lessen the pressure on the land. This pressure might be relieved by permanent migration within India, but, while seasonal migration prevails to a considerable extent, permanent migration does not take place on

the scale that might be expected. We think that the State should encourage the free movement of labour, and that where any restrictions exist, they should be reduced or abolished as soon as possible. In certain areas, migration is impeded by malaria or lack of water. Such conditions should be investigated and improved and definite schemes of colonisation introduced. In this connection we would quote the example of Burma where colonies for Burmans from the congested areas have been established on lands which have been disafforested, or on waste lands coming under irrigation for the first time. These colonies have been formed on a co-operative basis and are financed through their societies by the ordinary *taccavi* loans advanced by Government.

Finally, there is the question of relieving the pressure of population on the land by emigration abroad. Consideration of such possibilities is confined to the tropical and sub-tropical parts of the British Empire. Ceylon and British Malaya at present attract a large amount of Indian labour, but the limits of absorption in these parts have probably been reached. The British West Indies, Mauritius, British Guiana and the Fiji Islands also attract a certain number of Indian emigrants but British Guiana seems to be the only country which offers scope for migration on any considerable scale. A scheme of assisted migration to British Guiana, now under discussion, is worthy of further exhaustive investigation, as it would seem that that colony is capable of absorbing over two million people, or more than the total Indian population at present resident abroad.

XV. HORTICULTURE AND PLANTATIONS

CHAPTER XVII OF THE MAIN REPORT.

The cultivation of fruit and vegetables can be regarded from two points of view—the supply of the household and production for sale. In one form or another, vegetables appear almost daily in the Indian home and fruit is a popular addition whenever it can be obtained free or at small cost. In our Report, we deal in the main with the prospect of improving crops grown for the market. We assume that the relatively small number of market growers could be much more easily influenced by the advice and guidance of agricultural departments than could the growers for family consumption and that any improvements effected by the former would influence the cultivation of fruit and vegetables by the latter.

While there can be no question that there is much scope for the small cultivator who endeavours to supplement his income by growing cheap and hardy fruits for local sale, there are serious obstacles to be overcome by the grower who proposes to specialise in fruit-growing for the larger and more fastidious urban markets. The amount of capital required is, perhaps, the greatest single obstacle, especially as it appears from the information given to us that, in order to be successful, the small cultivator must rely on his orchard, once it has come into bearing, as his main source of income. In addition, the ordinary cultivator lacks the skill required in selecting varieties, planting, pruning and spraying which the successful production of high grade fruit for the market demands. Moreover, he does not, as a rule, live on his holding and the protection of small areas of fruit would be difficult even where the holding was in one compact block and quite impracticable if, as is so frequently the case, it consisted of a number of separate plots. The conditions, therefore, for the successful production of fruit for the market are that the grower, in addition to the possession of capital and acquired skill in the management of fruit trees, should have his holding in a compact block and be prepared to live on it in order to protect his crop during the ripening season. Further, supplies of water and manure must be readily available and a connection with a satisfactory market must be established.

The commercial fruit grower must in the main look to large urban centres for his market and he has to face the problems of transport and marketing. The difficulties of transport before the rail-head is reached are particularly great and can only be met by improvements in the packing of the fruit and the use of suitable containers. As regards marketing, sale takes place as a rule through an agent. The general absence of cold storage facilities and of an alternative market are obstacles to successful marketing. Regulated markets, when these are situated in areas in which fruit is grown to meet a local demand, might prove of much benefit to the wholesale vendor. The more immediate hope of expansion would seem to lie in the home markets, combined with the exploration of the demand in markets abroad for specially choice fruits, such as mangoes of good quality. These remarks apply with even greater force

to vegetables, because vegetables, to a much greater extent than fruit, may be regarded as having a potential market among the bulk of the population and, in these circumstances, the prospects of market gardening are more hopeful than those of fruit culture. Facilities for the disposal of fruit surplus to the demand for fresh produce become of great importance in the production of fruit on a commercial scale. It will be necessary to study the tastes of the mass of consumers in India as the home market is by far the most important, but an attempt might also be made to place one or two special products, such as mango pulp, on the foreign market.

There is much important research work to be done in connection with fruits and vegetables and the agricultural departments are devoting considerable attention to the subject. But, even more urgent than the need for research is the need to ascertain what the economic possibilities of increased fruit and vegetable production may be in order that the agricultural departments may know to what extent the development of their horticultural sections is justified in the interest of the small cultivator. Transport and marketing are basic difficulties and the provincial marketing officers should undertake the investigation of these problems.

While the economic possibilities of increased production are thus being worked out, we suggest that the agricultural departments should conduct experiments designed to ascertain the varieties of fruit and vegetables best suited to the various conditions of soil and climate. The information so obtained should be recorded in a form which will enable those intending to start fruit and vegetable production to profit by it. Should it become evident that there will be a large demand for young fruit trees and for seeds of improved varieties of vegetables, the agricultural departments should take steps to ensure that reliable stocks are obtainable by the public. The possibilities of introducing profitable exotics should also repay investigation. Nurserymen and seedsmen are making their appearance in India, but as a class they are not, as yet, fitted to make their own selections of fruit trees and vegetable seeds. The agricultural departments should use every means in their power to encourage and strengthen private enterprise in this direction.

The planting industries, which deal principally with tea, coffee and rubber, are well organised and both the Indian Tea Association and the United Planters' Association of Southern India maintain their own experimental stations and laboratories. They are in close touch with the Imperial and provincial departments of agriculture. We consider that the value of their scientific work should be recognised and co-operation between these associations and the agricultural departments secured by arrangements for their joint representation on the Council of Agricultural Research.

XVI. STATISTICS

The compilation of agricultural statistics of a uniform type for CHAPTER XVIII OF all India began in 1884. The Famine Commission THE MAIN REPORT. of 1880 drew attention to the importance of improving statistics and the early efforts of the agricultural departments were largely concentrated on this work.

The statistics published by the Government of India which have an agricultural bearing deal with (a) cultivation and crops; (b) livestock and implements; (c) vital statistics: and (d) economic data.

The *Agricultural Statistics of India* are published annually in two volumes, the first of which relates to British India and the second to certain Indian States. For each province or State figures are given of the total area, classified as cultivated, uncultivated and forests; the area and crops irrigated; the total area under crops and under each important crop; livestock, ploughs and carts; the incidence of the land revenue assessment; the harvest prices of certain important crops; and the average yield of the principal crops in each province. We have two recommendations to make regarding this publication. The date of issue might be expedited with advantage, and the figures might be given by districts as was formerly done.

A report is published quinquennially on the average yield per acre in each province of the principal crops in India, seventeen in number. There is also published in the *Indian Trade Journal*, a weekly publication, about one year after the year to which it relates, a provisional issue of Volume I of the *Agricultural Statistics of India* and full particulars relating to tea, coffee and rubber. A crop atlas has also been published.

Crop forecasts for all-India are issued each season for eleven of the principal crops and the *Estimates of Area and Yield of the Principal Crops in India*, including all crops for which forecasts are issued and also tea, coffee, rubber and certain other crops, are published annually. We suggest that, in this compilation, figures of areas and yield should be given separately for British India and the Indian States and that indigo should now be omitted.

Provincial forecasts, as well as those for the whole of India, are published in the *Indian Trade Journal*. We consider that the custom of publishing them in leaflet form should be revived. Arrangements should also be made for the issue of forecasts in the vernacular and for their supply to cultivators.

Except in Burma and the Central Provinces, forecasts are prepared by the agricultural departments. If these departments receive the statistical assistance we recommend later, we think it would be advantageous if forecasts in those two provinces were to be prepared by the agricultural departments. In Burma, however, the rice forecast should continue to be prepared as at present by the Commissioner of Settlements and Land Records.

A quinquennial census of livestock, ploughs and carts is held.

Much statistical information of value is contained in the provincial Season and Crop Reports and in various departmental reports. We suggest that the statistics in the reports of the irrigation, education and forest departments should be modified in certain directions to give fuller information.

The Statistical Abstract for British India summarises most of the information given in the reports referred to above.

Care should be taken to reconcile discrepancies between the figures given in the various departmental returns and those given in the *Agricultural Statistics of India*.

The figures for land classified as "not available for cultivation" and "culturable waste" are apt to give rise to misconception. The *Agricultural Statistics of India* suggest that nearly one quarter of the total area of British India is culturable but not cultivated. We consider that the classification requires careful re-examination.

It is generally admitted that the annual figures of the areas sown with the various crops attain a high standard of accuracy. In most provinces, there is a satisfactory agency for collecting the figures. The exceptions are Bengal and Bihar and Orissa. A fairly efficient machinery to which we refer below has been evolved to collect the statistics of jute production and we would suggest for consideration the possibility of extending it to other crops in the permanently settled parts of those two provinces and of Assam.

The three factors necessary for estimating the yield of a crop are area, normal yield and estimate of condition. The estimate of normal yield is based on crop-cutting experiments made over a number of years. At present, these experiments are generally conducted by the revenue departments. This practice should continue till the statistical side of the work of the agricultural departments is expanded. Changes in the figures of standard yield of crops should only be made on data based on accurate crop cuttings. The condition estimate is the most difficult to arrive at satisfactorily. We agree with the view expressed by the Board of Agriculture in 1919 that all attempts to teach the primary reporting agency to form an exact mental picture of a normal crop should be abandoned and that it is for the district officers and the provincial authorities through whom the village accountant's estimate passes, to correct it.

Jute is the only crop for the publication of the estimate of yield of which the Department of Commercial Intelligence and Statistics is not responsible. The Director of Agriculture, Bengal, issues the estimates not only for Bengal, but also for Bihar and Orissa and Assam. He now relies for his figures on presidents of *panchayats*. The figures are checked by the subdivisional officers and the district officers and forwarded to the Director of Agriculture. Agricultural officers assist the district officers, wherever possible. There appears to be no good reason why the trade interests should not collaborate with the Government of Bengal in the same way as the rice trade does in Rangoon. The fact that the cultivator

has an interest as important as that of the jute trade in the accuracy of these estimates should always be kept in mind.

The improvement in the statistics of cotton recently effected by the Indian Central Cotton Committee furnishes an example of the statistical benefits to be obtained from the thorough organisation of all interests connected with a particular crop.

The annual returns of rail and river-borne trade have been discontinued. We regard this as unfortunate as information regarding the movements of agricultural produce within India is now altogether lacking. We consider that they should be revived and that statistics should be collected of the trade on the main roads crossing the frontiers of India.

With regard to livestock statistics, we would recommend that the quinquennial census should be taken simultaneously in all provinces and that an effort should be made to ensure uniformity of classification. A suitable classification might be laid down by the Cattle Conference.

In the case of vital statistics, we suggest that separate figures should be given for urban and rural districts. We think also that the number and distribution of institutions for the treatment of disease and the strength and distribution of medical and health services, including trained midwives, should be shown separately for urban and rural districts as we consider it very important that the position of rural areas in regard to these essential services should be clearly stated.

There is also much useful work for private individuals and associations to do in correlating vital statistics and health data with those relating to agricultural and irrigation conditions. Similarly there is wide scope for scientific research into such socio-economic problems as indebtedness, mortgage debt and fragmentation of holdings. Such work can be taken up by university organisations and semi-official bodies of the type of the Punjab Board of Economic Enquiry.

If statistics are to be adequately dealt with, we consider that there must be a strengthening of staff all along the line. No statistical organisation at present exists in any province. In the first place, we consider that every Director of Agriculture should, without delay, be given a capable statistical assistant. His main concern would be with the compilation of crop forecasts, with statistics of agricultural production, with the technique and supervision of crop-cutting experiments and with the collection of statistics regarding prices. Such officers might suitably be attached to the central statistical organisation. Further, as the application of mathematics to agriculture has introduced an entirely new factor into scientific agriculture, we consider that a specialist with the highest qualifications in this branch of agricultural science should be attached to the Imperial Agricultural Research Institute.

Apart from agricultural problems, we would draw attention to the increasing importance which is being attached all over the world to statistical research as an aid to the formulation of social policies. We consider that the efforts of Government to promote rural welfare would

be greatly assisted by the appointment of a well qualified statistical officer to provincial headquarters to whom would be entrusted the duty of studying all aspects of the economic and social progress of the province. Such an officer should be the centre round which voluntary workers in the field of economic and social statistics would gather rather than the head of a purely official organisation. In short, he should be the director of a bureau of statistical information.

With regard to the central organisation, we consider that the Department of Statistics should be reconstituted as a separate department. The Director should be a man of recognised competence and should be relieved, as far as possible, of all avoidable routine matters in connection with ordinary statistics. It would, in our view, be useless to engage any but a first class statistician for the duties we have in mind. The officer selected must be of sufficient standing to make his advice acceptable not only to the provincial statistical officers but also to the business world and the informed public. One of his most important duties would be to establish close touch with these very important non-official sections of the community and we trust that provision will be made in the central statistical organisation for boards which would advise on the publication of statistics and their periodical revision and that representative leading economists, scientists and business men will find a place on these boards as well as officials of the departments interested. In this way, we trust that a school of statistical interpretation may develop in this country which would have little or no formal connection with Government but would, nevertheless, have access to, and be thoroughly familiar with official statistical material of all kinds. In fact, there would, we trust, gather round the Central Bureau of Statistical Information the beginnings of a Royal Statistical Society for India.

The whole basis of statistics in India urgently requires broadening. It should rest not on the work of a few government officials however able, but on the support of the informed public and through them on the recognition by the legislatures and by the general public that modern statistical methods are in a position to make an indispensable contribution to the successful development alike of scientific agriculture and of social administration.

We consider that every opportunity should be taken to utilise the statistical experience of the International Institute of Agriculture at Rome.

As a primary agency for the collection of agricultural statistics in temporarily settled areas, we see no practicable alternative to the continued employment of subordinate revenue officials, but more use should be made of non-official agencies.

XVII. THE AGRICULTURAL SERVICES

We consider here the recruitment, organisation, pay and conditions of service of the personnel of the agricultural departments with special reference to the increased responsibilities which will be imposed upon them if the recommendations made in the Report are accepted. Recruitment for the Indian Agricultural Service ceased in 1924 in consequence of the general decision taken, on the recommendation of the Royal Commission on the Superior Civil Services in India, not to recruit further for such of the all-India services as were administering subjects, of which agriculture was one, which had been transferred under the Constitutional Reforms of 1919, to the control of the Governors of provinces acting with their Ministers. When recruitment for the Service ceased in 1924, its sanctioned strength was 157; 19 posts under the Government of India and 138 under local governments. The Service was, however, considerably under strength and only 109 posts were filled. This has since fallen to 93; 12 officers serving under the Government of India and 81 under provincial governments. To these 81 officers there should be added 16 officers holding permanent appointments not included in the cadre of the Indian Agricultural Service. Thus the duties of the higher branches of the service in the provinces are now being performed by 97 officers and this may be regarded as the minimum strength required for the existing work.

Prior to 1920, Bombay and the Central Provinces were the only provinces which had a regular provincial service. As a result of the recommendations of the Public Services Commission, commonly known as the Islington Commission, such services were constituted in all provinces after 1920, partly by absorption of special posts, partly by the promotion of officers of the upper subordinate services and partly by direct recruitment. In the present depleted state of the Indian Agricultural Service some officers of the provincial services officiate more or less continuously in professorial or research appointments. In all provinces except Burma, the minimum pay of this service is Rs. 250 per mensem and the maximum Rs. 750 per mensem. In Burma, the minimum and maximum are Rs. 300 and Rs. 800 respectively. The present strength of the provincial services is 157.

Below the provincial services in all provinces come subordinate services, the designations of which are as various as their rates of pay. In most provinces, the qualification for the upper grade of the subordinate service is the possession of the degree or diploma of an agricultural college. Scales of pay differ greatly but, in no province, is the minimum starting pay of the upper grade less than Rs. 60 or the maximum more than Rs. 300 per mensem. The upper subordinate services provide managers and assistant managers of farms, demonstrators of agricultural improvements, and laboratory and teaching assistants at the colleges; it also renders general help in the work of the department under the orders of the deputy or assistant directors of agriculture. The lower grade of the subordinate services consists mainly of those who

hold a certificate that they have passed the two years' course of an agricultural college. It provides overseers for the smaller farms and for demonstration plots, and also sub-assistants on the research side of the colleges. The rates of pay vary greatly, but nowhere is the minimum less than Rs. 30 or the maximum more than Rs. 180 per mensem.

Below the two grades which have been described comes a large class of subordinates recruited for the most part from the sons of cultivators who are literate but have had no secondary education. They have, however, undergone a course of special training. Their rates of pay vary from a minimum of Rs. 15 per mensem to a maximum of Rs. 60.

For convenience of reference, we propose throughout the remainder of this chapter to designate appointments in the new superior provincial agricultural services, which will ultimately take over the duties of the Indian Agricultural Service entirely, as Class I appointments, and appointments in the existing provincial agricultural services as Class II appointments.

We consider the posts of Director of Agriculture and principal of an agricultural college of such importance that we would schedule them as selection posts outside the cadre of Class I officers. The officer selected for the directorship should combine administrative capacity with high scientific qualifications. The administrative responsibilities of the directors are certain to grow and much of the technical work at present in their hands must pass to the charge of officers subordinate to them. We cannot too strongly state our conviction that the directorship of agriculture is one of the key posts in rural development and that agricultural advance must in a very great degree depend upon the suitability of the officer appointed. It may happen that the administrative capacity we postulate as an essential qualification for a Director of Agriculture may not be forthcoming in the Agricultural Department of a particular province, when a vacancy in the appointment occurs. In such circumstances, we think that the local Government should, in the first instance, turn to the Agricultural Department of another province and, failing that, to the Indian Civil Service.

There is no appointment, except that of Director of Agriculture, the holder of which has greater opportunities for influencing the course of agricultural development in his province than the principal of an agricultural college. If this officer fails to take advantage of these opportunities, and if, in consequence, the efficiency of the college is lowered, agricultural progress in the province must suffer a set back from which it may take years fully to recover. In the event of a suitable officer not being available from the Agricultural Service, selection from the Educational Service should be considered.

In view of the greatly increased responsibilities which will be placed on directors of agriculture if the departmental organisation develops in the way we recommend that it should, we consider that their pay and status

should be improved. We therefore recommend that directors of agriculture should be placed on an equality with the heads of other important departments such as those of Public Instruction and Forests. The principals of agricultural colleges at present receive pay on the time scale of the Indian Agricultural Service with a special pay of Rs. 150 per mensem. The ordinary time scale of the Indian Agricultural Service is not, in our opinion, commensurate with the responsibility of the post and we would, therefore, suggest a scale of Rs. 1,500—50—2,000. The special pay of Rs. 150 per mensem would be abolished. In the case of both these appointments, overseas pay would, of course, continue to be given to those officers who are eligible for it and the posts would continue to be pensionable under the ordinary rules. The Director of Agriculture should be eligible for the higher rate of additional pension.

In some of the larger provinces, the additional responsibilities which fall on the Director of Agriculture as the result of the acceptance of our recommendations may render it desirable that the Director should be given the assistance of a joint director. If such an appointment is made, we consider that the joint director should be given, in addition to his pay in the ordinary line, suitable special pay in recognition of his increased responsibility.

Although recruitment for the Indian Agricultural Service ceased in 1924, no province has, as yet, constituted a new Superior Provincial Service to take its place. We offer the following suggestions as to the manner in which the agricultural services should be recruited and organised and the terms and conditions of service which should be offered. We recognise, however, that the financial circumstances of the provinces differ widely and that a scale of organisation which one province is in a position to adopt immediately may only be a distant ideal to another.

As regards the qualifications required of officers, we consider that the time has now come when the problems of agricultural research in this country demand a more specialised type of officer. In such branches of science as plant genetics and the investigation of plant disease, the conditions are now passing, if, indeed, they have not already passed, in which success comes rapidly because the field of research is virgin ground. Agricultural research in India now requires men who combine scientific knowledge and technique of the first order with the vision and creative power essential to the opening up of new and original lines of work. We are convinced that the field of recruitment for the Superior Provincial Service in any province ought not to be restricted to the province itself or to India. The best man should be selected, wherever he can be found. As regards qualifications, we consider that more importance should be attached to the record of the candidate in the field of research in which the appointment is being made than to his academic distinctions, but an honours degree in science at a university of repute, or its equivalent, should be regarded as an essential qualification.

As regards terms of engagement, we are not in favour of short-term agreements. The adoption of such a policy would mean, in many cases,

that valuable experience gained by an officer during his period of service would be lost to India at the end of it. At the same time, special arrangements will be necessary if research workers of the requisite calibre are to be recruited. The basic pay which might be sufficient to attract the right type of administrative or teaching officer is not, in our opinion, sufficient to secure the first class research worker. We consider that this can best be given in the form of special pay, personal to the individual officer. In view of the strong competition for first class men from private agencies and the new Colonial Scientific Service during the period of its formation, we consider that provincial governments would do well to institute a system of scholarships for their candidates. These scholarships would be awarded to graduates selected as possessing the kind of qualifications required and should be of sufficient value to maintain the scholar whilst he is obtaining the post-graduate qualifications necessary for research posts. As special machinery will be required to award the scholarships, to arrange for post-graduate courses of study at suitable centres for the holders of scholarships and to watch their progress, we consider it desirable that the scheme should be administered by a sub-committee of the Council of Agricultural Research.

In organising their research departments, provincial governments should realise that there are two quite distinct types of research workers—men capable of original research and men fitted only to carry on work along well established lines. Work of this character is an essential part of the work of a research station, but does not demand talents of a high order. It is most important that there should be no confusion between the two types when the creation or filling of an appointment on the research side is under consideration. Where what is required is routine work, this should be provided for by an appointment in Class II. It follows that promotions from Class II to Class I in the case of research posts should only be made where there are Class II officers available who are endowed with the qualifications of the true research worker.

If India is to achieve a greater measure of self-sufficiency in the matter of higher agricultural training, it is essential that the standard of teaching in the agricultural colleges should be a high one. For on the quality of the instruction in the fundamental agricultural sciences which students have received in the agricultural colleges will depend the use they are able to make of the post-graduate facilities which we have recommended should be provided at Pusa. We are, therefore, of opinion that the teaching side of the agricultural colleges should be strengthened and that the professorships in agriculture and agricultural economics and also, where the professorships in botany and chemistry are held by research officers, the senior lecturerships in these subjects, should invariably be filled by officers of the Indian Agricultural Service or by Class I officers of the new provincial services. We do not contemplate that the special pay we recommend for the holders of research posts should be attached to any posts in the colleges, the duties of which are solely or primarily teaching duties.

On the administrative side, we contemplate that a considerable number of vacancies in Class I appointments will be normally filled by the promotion of Class II officers. In the case of direct appointments, a university degree with honours in science or the diploma of a recognised agricultural college or other like distinction combined with practical experience of agriculture should be insisted on. Where the candidate has undergone his previous training in a provincial agricultural college or an Indian university, a post-graduate course should be made an essential qualification. All officers appointed to Class I posts, whether directly recruited or promoted, should be placed on probation for a period sufficient to determine their fitness. This period can hardly, we think, be less than two years. Confirmation should unhesitatingly be refused when a probationer has failed to justify his selection.

We consider that it will make for efficiency if, during the earlier years of service, interchange is freely allowed between the administrative, the research and the teaching branches of the service.

Subject to the reservation already made in regard to special pay for research posts and to the possibility that it may prove desirable to attach similar pay to administrative posts requiring exceptional qualifications, such as the deputy directorships for demonstration and propaganda work and for marketing investigations, we consider that the basic time-scale now in force for the Indian Agricultural Service (Rs. 350 to Rs. 1,250 per mensem) should be sufficient for Class I appointments. We regard it as of the greatest importance for obtaining men of outstanding merit who will ordinarily be in a position to choose the employment the conditions of which appeal to them most, that, before recruitment for Class I appointments commences, effect should be given to the recommendations of the Royal Commission on the Superior Civil Services in India that local governments and local legislatures should take immediate steps to pass Public Service Acts regulating both the new and the existing provincial services. That there must be some authority regulating service questions which is external to provincial governments if the evils of the intrusion of political influences are to be avoided seems to us self evident.

We consider that the relations between the various provincial services should be of the closest possible character and that arrangements should be made for the interchange of officers to deal with special problems. Similarly workers in India should keep in touch with other Empire workers. The creation of a chain of Empire research stations would furnish a unique opportunity for establishing personal relations, as it would greatly facilitate arrangements for interchange of visits between research workers in India and those in other parts of the Empire, the direct and, even more, the indirect results of which should be of the greatest value to both. Study leave should be freely given and, in the case of research workers, we trust that this will lead, to the development, in the course of time, of a system of exchange of officers between Empire and Indian research stations for definite periods.

Although we do not anticipate any substantial change in the nature of the duties which fall to the existing provincial agricultural services,

their duties will grow rapidly in importance as agricultural development proceeds. As advisers to the agricultural associations, taluka development associations, co-operative better farming societies and the other organisations through which, we trust, the desire for agricultural improvement will find increasing expression, they will continue to act as liaison officers between the expert officers in Class I and the individual landholder and cultivator. It will be important, therefore, that promotions to Class II posts shall be made strictly by selection on grounds of merit and that no weight should be attached to seniority. We see no reason to suggest any change in the system under which members of these services are recruited. Vacancies in administrative posts will ordinarily be filled by promotion from the upper grades of the subordinate services. Direct appointments will, as a rule, be for research and teaching duties. Until Public Service Commissions are set up in the provinces, we are of opinion that promotions and direct appointments to these services should be made on the recommendation of a strong selection committee.

We next come to the lower grades in the agricultural services. It is the men of these grades who carry out all the detailed work of the department, such as the management of the smaller farms, the selection, multiplication and distribution of seed, and the management of livestock. This work demands high qualities of skill and intelligence for its successful performance. The upper grades of these subordinate services are recruited from graduates and holders of diplomas of the agricultural colleges and, in order to remove any possible misapprehension as to the importance of the duties performed, we recommend that, in all provinces, the two higher grades of the subordinate services should be designated agricultural assistants, Class I and II. As a proportion of these assistants will be promoted in the normal course to Class II of the provincial agricultural services, we would emphasise the importance of careful selection on first appointment and the need for a period of probation with a strict review of the record of the probationer before he is confirmed.

We contemplate that the Research Institute at Pusa will set a standard for all research institutions in India, and we also hope that it will become a centre for post-graduate study for passed students of the provincial agricultural colleges. If Pusa is again to set the standard of agricultural research in India and become the recognised centre of post-graduate training, it will be necessary that its superior staff should consist of research workers and teachers of the highest calibre. In addition to the Agricultural Adviser to the Government of India, there are at present in residence at Pusa nine officers holding what are known as Class I appointments in the Imperial Department of Agriculture, of whom six are heads of the sections into which the work of the Institute is divided, namely, Bacteriology, Botany, Chemistry, Cultivation and Cattle breeding (in charge of the Imperial Agriculturist), Entomology, and Mycology. The Physiological Chemist and the Imperial Dairy Expert whose headquarters are at Bangalore are also heads of their respective sections. The number and character of the posts which will be required in future cannot be estimated with any certainty, but in considering the

strength of the staff at Pusa, it should be borne in mind that Pusa is not an ordinary research institute, as the term is used in other countries, but a group of institutes and that the sections into which it is divided have, up to the present, been staffed on a less generous scale than, for example, institutes in Great Britain. The Director and heads of sections will require to be most carefully selected. Whilst we have no desire to debar the appointment either as Director or Head of the Section, of any officer of exceptional merit already in the service, we consider it necessary under existing conditions, that these appointments should, in the main, be filled by direct recruitment from abroad. Other Class I officers should be recruited either directly or by selection from the Indian Agricultural Service or the superior provincial agricultural services. We prefer that the staff required both for Pusa itself and for its sub-stations should be recruited as members of a permanent service and not on short-term agreements; and we propose that this service should be called the Central Agricultural Research Service. For the Director it will be necessary to fix such a rate of pay as may be required to obtain the services of the best man available. Although we find it difficult to suggest an appropriate scale for the heads of sections, we consider a scale of Rs. 1,500—50—2,000 to be the minimum that is likely to attract men of the calibre that we regard as essential. Provident funds should be established for both the Director and heads of sections where these officers do not already possess pensionary rights.

Although we are unable, as we have stated, to estimate the number of posts required, we consider that, as a commencement, there should, in addition to the heads of sections, be at least one Class I officer attached to each section. The relationship between the heads of sections and these Class I officers will be very much the same as that between the incumbent of a Chair at a university and the lecturer on the subject for which the Chair is founded. We contemplate that these officers after a limited period of probation, which might suitably be fixed at three years, will either be confirmed in their appointments and ordinarily remain in the Central Agricultural Research Service for the remainder of their service, or be reverted to their provinces. For these officers we consider that the existing time-scale of pay of the Indian Agricultural Service with a suitable addition to the time-scale in substitution for the existing Pusa allowance is sufficient. In order to secure uniformity, provident funds should be established for officers directly recruited to these appointments. Officers of the Indian Agricultural Service or of Class I of the provincial services would continue to earn pension under the ordinary rules.

The superior staff at Pusa has at present the assistance of officers who are designated Class II officers in the Imperial Department of Agriculture. They are, as a rule, graduates or holders of diplomas of the agricultural colleges or graduates of universities who have distinguished themselves in science. We consider that this valuable class should be developed and its status raised. We think that it would be an advantage if appointments to this class were largely filled by promising junior

Class I officers in the provinces and partly by Class II officers in the provinces who have done work of outstanding merit. With a view to forging an additional link between the Pusa and the provincial services, we think that the tenure of these appointments should be limited to five years when held by Provincial Service officers. Graduates of Indian universities and passed students of agricultural colleges who have undergone a period of post-graduate training would continue to be eligible for direct appointments to this class. As regards pay, we suggest that provincial service officers should receive their provincial scale of pay with a Pusa allowance of Rs. 150 per mensem and those directly recruited should receive pay on the scale of Class II officers in the Provincial Service with a similar allowance. Appointments in this class should in every case be pensionable.

We hope that, as the result of the establishment of the Council of Agricultural Research, the Pusa staff will be brought into far closer relation with the provincial agricultural departments than now exists. Their visits to provinces cannot fail to enlarge the outlook of members of the Central Agricultural Service and to increase their experience. The cost of short visits should, we consider, be regarded as part of the normal expenditure of the Pusa Institute; and any obstacle to this course arising from existing rules governing the financial relations between the Imperial and provincial governments should be removed.

In conclusion, we record our considered opinion that restriction of recruitment for the new superior provincial agricultural services to a province or even to India would tell seriously on efficiency. From the point of view of wider outlook and variety of experience, officers recruited from abroad can make a valuable contribution to the development of Indian agriculture and we, therefore, strongly endorse the hope expressed by the Royal Commission on Superior Civil Services in India in regard to the continued co-operation of European officers.

XVIII. MISCELLANEOUS

Agricultural development in the minor provinces, which remains under the direct control of the Government of India, deserves, in our opinion, more attention than it has hitherto received. Much the most important of these provinces, though it is not the largest in area, is the North-West Frontier Province. The agricultural and other rural problems of this province have been examined with those of the nine major provinces of India in the previous chapters of this Report and it is, therefore, unnecessary to discuss them further here. The other five minor provinces under the control of the Government of India are Baluchistan, Ajmer-Merwara, the Andaman Islands, Coorg and Delhi. We consider that, with the exception of Delhi, they should have a definite agricultural organisation which, if they cannot finance it themselves, should be a charge on central revenues. For research, they should rely on Pusa and the research staff of the neighbouring major provinces. As regards district work, the staff of a deputy director's circle would form a suitable unit for Baluchistan, Ajmer-Merwara, Coorg and the Andamans. The deputy director should be obtained on deputation, preferably from the neighbouring major province, and should be given a special allowance in view of his increased responsibility. The directors of agriculture and the heads of the veterinary departments in the major provinces concerned should act as advisers to the heads of the minor provinces and should visit them periodically. Subordinate staff should be recruited on the advice of the deputy director. The Province of Delhi should continue to look for assistance to the Punjab Agricultural and Veterinary departments.

We trust that the Council of Agricultural Research will take a special interest in the agricultural development of these tracts. In order that agricultural progress in these provinces should be on sound lines it is essential that increased attention should be paid to the development of education and co-operation.

The foundations of an active policy of co-operation in agricultural and co-operative matters between the Government in British India and Indian States have already been laid through representation of some of the States on the Indian Central Cotton Committee and the Board of Agriculture. It is hoped that the manner in which co-operation can be rendered more effective, and more especially the manner in which Indian States can best be brought into the organisation for research in British India, will receive early and careful consideration from the Government of India and the rulers of Indian States.

From the point of view of rural welfare generally, we welcome the foundation in 1927 of a Local Self-Government Institute for the Bombay Presidency. The object of the Institute appears to us an admirable one. It is "to acquaint the people with the meaning and ideal of local self-government, its importance, its problems and the methods of dealing with these problems." The Institute will have local branches throughout the presidency and one of its main activities will be the

organisation of district, divisional and provincial conferences. The district conferences will be held once or twice a year and will provide an opportunity for representatives of local bodies in the district to meet and discuss local problems and difficulties. The scheme appears to us to hold out great promise of advantage to rural as well as to urban interests. It also provides a common meeting ground for both, and, by so doing, should do much to bring about an increasing sense of mutual interest and an increasing spirit of mutual help. We commend the principles of the Bombay scheme to the notice of other provincial governments and to the local self-governing bodies in their provinces.

The close relations of meteorology and agriculture are obvious. The study of the laws governing weather is the concern of the meteorologist: the effect of weather on crops is a matter for the agriculturist. The transfer of the headquarters of the Meteorological Department from Simla to Poona makes opportune an examination of the action which should be taken to promote the investigation of the problems of agricultural meteorology and to decide which departments shall be responsible for the different branches of the work. Investigations by scientists interested in agriculture can be undertaken in two directions; the first is statistical and the second biological. Much useful light would be thrown on agricultural questions if the weather data collected by the Meteorological Department were correlated with the statistics of area sown and yield of crops collected by the Revenue Department. Agricultural departments should make themselves responsible for meteorological studies relating to the influence of weather conditions on the growing crop. Such observations and study seem to be particularly necessary in Sind in view of the possibility that the completion of the Sukkur Barrage will produce a pronounced effect on the climate.

India should continue to adhere to the International Institute of Agriculture at Rome and to send representatives to the meetings of the General Assembly. As regards representation on the Permanent Committee of the Institute, the interests of India can, as at present, be adequately looked after by the British representative. The Institute has collected much information of the greatest value to India and its usefulness has recently been further enhanced by the establishment of a Bureau of Tropical and Colonial Agriculture. It is, therefore, very desirable that officers of the agricultural and allied departments should be encouraged to visit the Institute for the study of a specific subject when on leave or duty in Europe.

The principal functions of the Imperial Institute in London are to serve as a clearing-house for information relating to the production and utilisation of the raw materials of the Empire and to carry out preliminary investigations of such materials in its laboratories. The Institute can render much useful help to agricultural workers and commercial interests in India and wide publicity should be given to the facilities it offers. The reorganisation of the Indian gallery at the Imperial Institute, on the lines followed by the Dominions and Crown Colonies and the renewal of the subscription for its maintenance, should be considered.

XIX. CONCLUSION

We have been directed to examine and report on the present conditions of agriculture and rural economy in British India and to make recommendations for the improvement of agriculture and the promotion of the welfare and prosperity of the rural population.

The aim of the suggestions and recommendations we have made in the preceding chapters has been to bring about greater efficiency throughout the whole field of agricultural production and to render the business of farming more profitable to the cultivator. Throughout our Report, we have endeavoured to make plain our conviction that no substantial improvement in agriculture can be effected unless the cultivator has the will to achieve a better standard of living and the capacity, in terms of mental equipment and of physical health, to take advantage of the opportunities which science, wise laws and good administration may place at his disposal. Of all the factors making for prosperous agriculture, by far the most important is the outlook of the peasant himself.

This, in the main, is determined by his environment and it follows, therefore, that the success of all measures designed for the advancement of agriculture must depend upon the creation of conditions favourable to progress. If this conclusion be accepted, the improvement of village life in all directions assumes at once a new importance as the first and essential step in a comprehensive policy designed to promote the prosperity of the whole population and to enhance the national income at the source. The demand for a better life can, in our opinion, be stimulated only by a deliberate and concerted effort to improve the general conditions of the country-side, and we have no hesitation in affirming that the responsibility for initiating the steps required to effect this improvement rests with Government.

The realisation of this important truth has led, in recent years, to a large increase in expenditure on the departments concerned with rural welfare. None the less, we feel that its force is inadequately appreciated by the Government of India and by local governments and that the necessity that the rural problem should be attacked as a whole, and at all points simultaneously, is still insufficiently present to their minds. We cannot but think that the failure to grasp the full significance of the proposition we have laid down in some measure explains the absence of any co-ordinated attempts to effect that change in the surroundings and in the psychology of the peasant without which there can be no hope of substantially raising his standard of living.

If the inertia of centuries is to be overcome, it is essential that all the resources at the disposal of the State should be brought to bear on the problem of rural uplift. What is required is an organised and sustained effort by all those departments whose activities touch the lives and the surroundings of the rural population.

It is, no doubt, the recognition of the need for co-ordination that has given rise in many quarters to the view that lasting progress is unlikely

to be achieved unless, in all provinces, the activities of the various departments concerned are co-ordinated by development boards, advisory committees, or officers charged with the specific duty of securing combined action towards a given end. Development boards exist in some provinces, advisory committees in all. They are not without their value in bringing departments together and in interesting the leaders of public opinion in departmental activities. But there are definite limits to the extent to which governments may properly or usefully delegate the performance of their functions. The responsibility for framing policy, and for combining the activities of two or more departments in order to give effect to that policy, must remain that of Government and of Government-alone.

It is no part of our duty to make recommendations regarding the internal organisation by which governments should seek to effect co-ordination. We would, however, point out that, in Indian conditions, a very special measure of responsibility in this direction falls upon the Viceroy and upon the Governors of provinces. Throughout our enquiry, we have been much impressed by the extent to which the Viceroy can, by the display of a personal interest in agricultural matters, forward the cause of India's premier industry. But the immediate responsibility of provincial Governors in this matter is the heavier, since the services most directly concerned with rural development are administered by provincial agency, and since it is they alone who provide a link between the reserved and the transferred departments. The responsibility of the Ministers in charge of the transferred departments, which include all those most directly concerned with rural welfare, is also a heavy one and they will need all the assistance that strong secretariats with senior and experienced administrators at their head can give them.

But though we hold it to be the duty of governments to initiate a combined movement for the betterment of the rural population, we recognise that success on a large scale can be rendered permanent only if the sympathy, interest, and active support of the general public can be enlisted. So vast is the population and so extensive are the areas concerned, that no resources which could conceivably be commanded by the State would be adequate to the task in hand.

Our recommendations extend to so wide a field that it has not been possible for us to frame any exact estimate of the cost of such of our proposals as involve expenditure or to classify them in order of urgency. We would express the earnest hope that, as the funds necessary to carry out the policy of rural development we have attempted to outline become available, the various legislatures will be willing to place them at the disposal of the appropriate departments. We are confident that the members of those legislatures will play their part in creating a public opinion favourable to the advancement of a great endeavour. Our enquiry has convinced us that, given the opportunity, the cultivators of India will be found willing and able to apply in progressive degree the services of science and of organisation to the business of agricultural production.

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GLOSSARY

Bajra	A small millet (<i>Pennisetum typhoides</i>).
Bund	A dam, a field embankment.
Ghi	..	..	Clarified butter.
Gur	..	..	Unrefined Indian sugar; jaggery.
Juar	..	..	The large millet (<i>Andropogon sorghum</i>).
Kala-azar	..	..	A malignant fever caused by an infection by a parasite (<i>Leishmania Donovani</i>).
Kamianti	..	..	An agreement, written or oral, under which a person undertakes to perform labour for an advance of money or for a sum due or in lieu of interest on such debt.
Lac	..	..	A resinous incrustation formed on the bark of wigs of certain trees by the action of the lac-insect (<i>Laccifer lacca</i>).
Lakh	..	..	One hundred thousand.
Panchayat	..	..	Lit: a committee of five. Used to describe an association of any number of persons instituted for objects of an administrative or judicial nature.
Rabi	..	..	The spring harvest: crops sown in the autumn and reaped at the end of the cold weather.
Régur	..	..	Black cotton soil.
Seva Sadan	..	..	Lit: "home of service". A charitable organisation.
Taccavi	..	..	An advance made by Government to cultivators for agricultural purposes.
Taluka, Tehsil	..	..	A local revenue division of a district.
Zamindar	..	..	A landowner, a peasant-proprietor.